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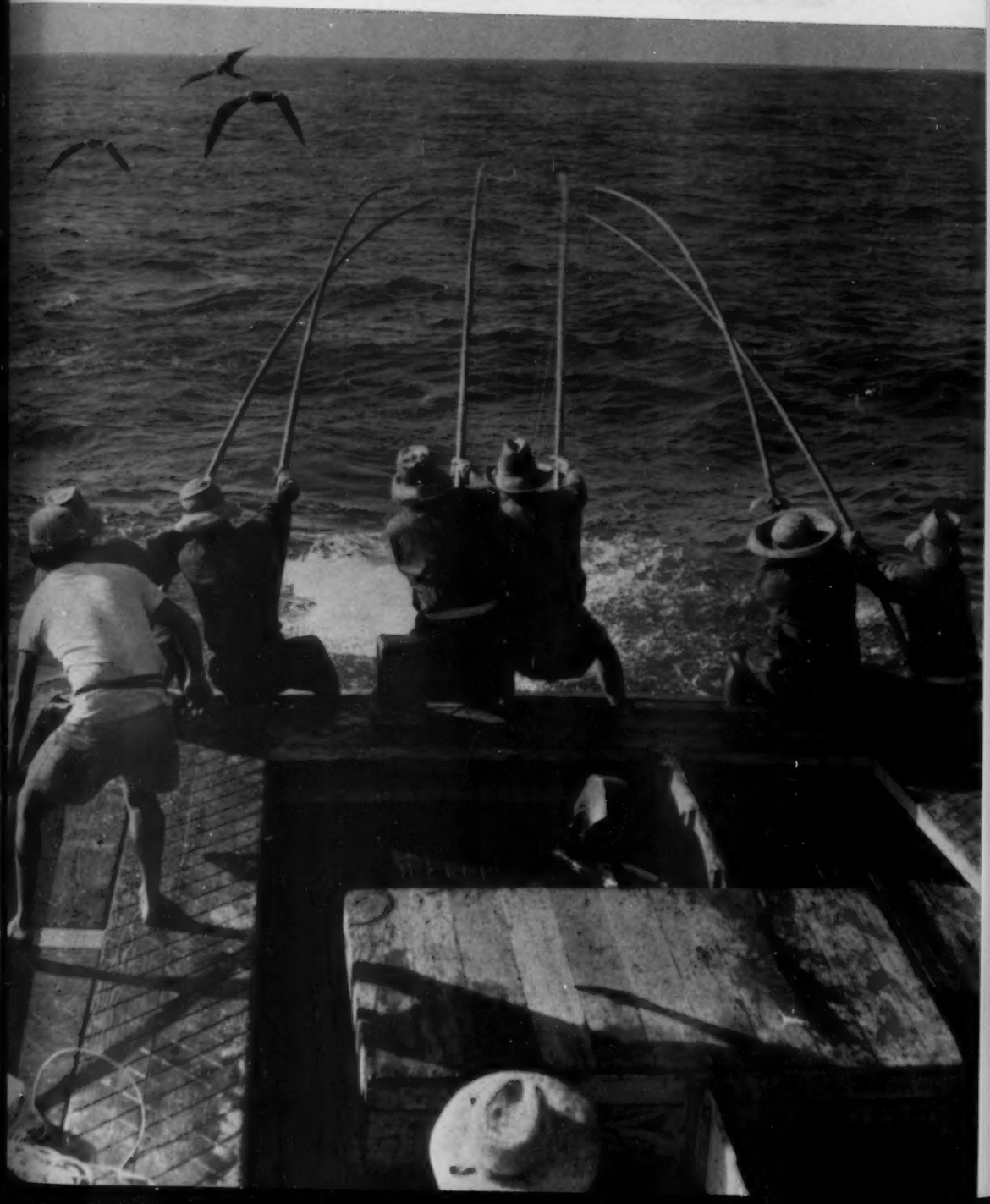

COVER: Tuna fishing in the Pacific.

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

Fishermen's Memorial
Gloucester, Mass.

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Foreword

Having served as Governor of Alaska, the Nation's leading State in value of fishery products landed, I have a special interest in the future of our fisheries.

While it is true that some segments of our commercial fisheries are at present economically distressed, there are other segments which are prospering. Actually, we have many fishing industries, because the factors which affect the salmon industry in the Pacific Northwest, for example, are entirely different from those affecting the menhaden industry along the Atlantic coast.

The Bureau of Commercial Fisheries is working with representatives of States, universities, and industry laying the groundwork for a Joint Master Plan for Commercial Fisheries. The purpose of the Joint Master Plan is to provide a mechanism for considering the views of all agencies and groups working on U.S. fishery problems and to identify areas in which increased efforts are required. We are fully aware that the plan is no panacea, but it can serve as a guide for a coordinated course of action in the future.

There is more at stake than simply our ability to supply our domestic markets. We must think of the vast quantities of underutilized species off our shores that could be harvested and used to supply the growing need for high quality protein throughout the world.

Our commercial fisheries need attention. They are a valuable natural resource which must be maintained and managed to provide the maximum sustainable yield. I believe we are moving in the right direction.

Walter J. Hickel

Walter J. Hickel
Secretary of the Interior

U.S. AND POLAND SIGN MID-ATLANTIC FISHERIES AGREEMENT

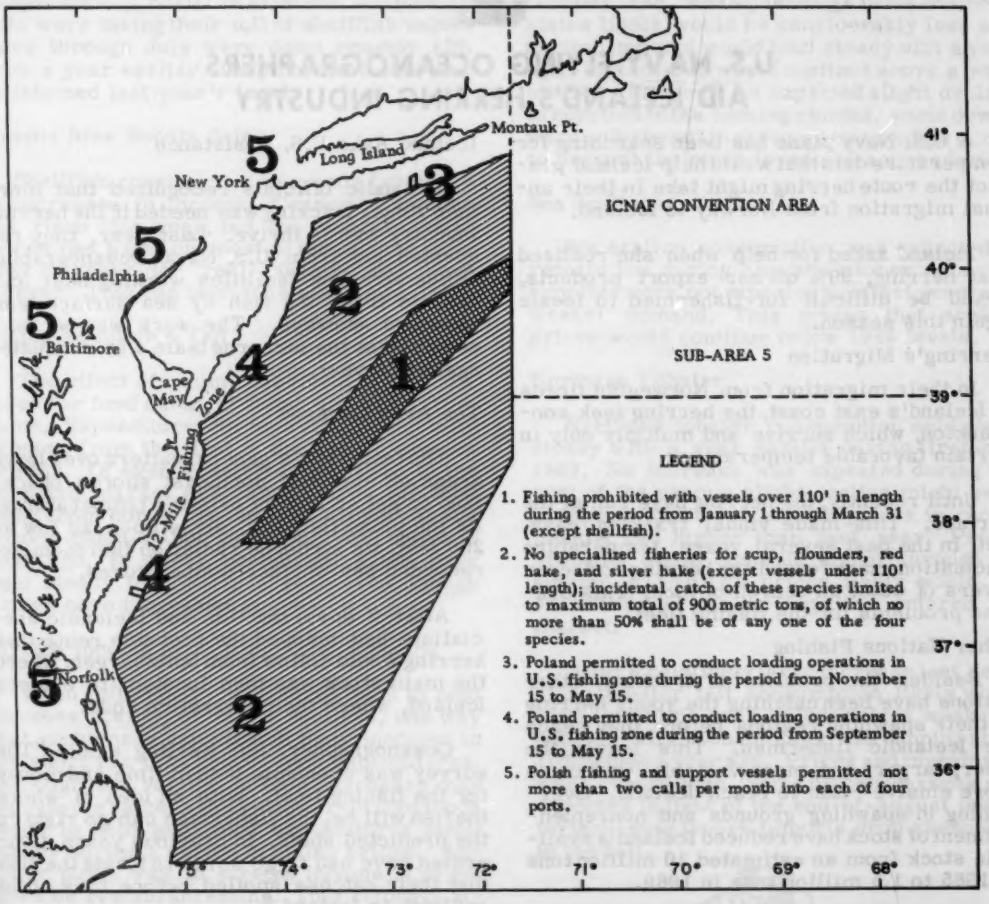
The U.S. and Poland have signed a one-year agreement on mid-Atlantic fisheries. It took effect June 12, 1969.

The agreement provides for cooperation in fishery research leading to a conservation program for species fished by either country off the U.S. mid-Atlantic coast. It also provides that Poland take special measures to protect species of special concern to U.S. fishermen--and that the U.S. facilitate entry of Polish fishing and supply ships into 4 U.S. ports.

Both countries will conduct joint research on fish of common concern, and exchange scientific and statistical information on the mid-Atlantic fisheries. And, to foster better understanding between Polish and U.S. fishermen, fishery representatives will be exchanged between the fleets on the fishing grounds.

Prohibitions

To conserve red hake, silver hake (whiting), scup, and fluke, Polish fishermen will refrain from fishing in a specific area where



those species concentrate during winter months. Polish fishermen who have been fishing primarily for herring and mackerel will not fish red hake, silver hake, scup, and fluke in the mid-Atlantic. In addition, they will take special precautions to avoid concentrations of groundfish during the entire year.

Loading Zones

In return, Polish fishermen will be allowed to unload and transfer their catches in 3 areas within the U.S. 9-mile contiguous fishing zone. One is off Long Island, adjacent to the Soviet loading zone; the second, off New Jersey, south of Atlantic City; and the third, off Virginia, north of Chesapeake Bay. The loading zones may be used only during winter and early spring. No Polish vessels will be allowed to fish in the contiguous zone.

Port Entry

Both governments agreed to allow a limited number of fish and supply ships into their ports. Use of port facilities at New York, Philadelphia, Norfolk, and Baltimore by a limited number of Polish fishing and supply vessels was made easier.

U.S. NAVY FLYING OCEANOGRAPHERS AID ICELAND'S HERRING INDUSTRY

A U.S. Navy plane has been searching for temperature data that would help Iceland predict the route herring might take in their annual migration from Norway to Iceland.

Iceland asked for help when she realized that herring, 90% of her export products, would be difficult for fishermen to locate again this season.

Herring's Migration

In their migration from Norwegian fiords to Iceland's east coast, the herring seek zooplankton, which survive and multiply only in certain favorable temperatures.

Until recently, the herring have run at the surface. This made visual tracking easy. But, in the past several years, temperature fluctuations have forced the herring to deeper layers of water in search of food. This created problems for the fishing fleet.

Other Nations Fishing

Besides the problem of tracking, other nations have been catching the young herring in their spawning regions before they reach the Icelandic fishermen. This leaves the older, larger, and more valuable--but much more elusive--fish to reach Iceland. Overfishing in spawning grounds and nonreplenishment of stock have reduced Iceland's available stock from an estimated 10 million tons in 1965 to 1.5 million tons in 1969.

Iceland Asks U.S. Assistance

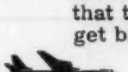
Icelandic officials recognized that more than visual tracking was needed if the herring industry was to thrive. Last year, they requested aid from U.S. Naval Oceanographic Office airborne facilities working near Iceland to track the fish by sea-surface temperature surveys. The work was so successful that the airborne team was requested again this year.

The Area Covered

The team flew a general pattern over large areas off east and northeast shores of Iceland to get an idea of existing temperatures. As the plane flew low, sometimes as low as 200 feet, its airborne radiation thermometer recorded sea-surface temperatures.

After 2 days, the U.S. and Icelandic specialists had mapped the probable route that herring would follow from Spitzbergen, where the main stock was then located, to eastern Iceland, where their migration ends.

Oceanographer Jeff Kerling said: "The survey was economic both in time and money for the fishing fleet. With an idea of where the fish will be, the fishermen can go right to the predicted spots. In previous years, fishermen have had to go so far to locate the fish that their catches spoiled before they could get back to Iceland."



UNITED STATES

SHELLFISH SALES SLUGGISH

Consumer demand for shellfish has been sluggish for most of this year, report BCF economists. The shellfish industry is not experiencing the almost-annual increase in consumption that has prevailed throughout the 1960s.

Record high prices in summer 1969--10% or more above a year earlier--for fresh and frozen shrimp, northern lobsters, and lobster tails were taking their toll of shellfish sales. Sales through July were down roughly 10% from a year earlier. Only northern lobsters maintained last year's level.

Income Rise Boosts Sales

Shellfish consumption responds favorably to increases in income. Consumer income has risen this year, but the general rise in prices has wiped out most of the income gain. Any increase in "real" income has been meager. This has been true since mid-1968.

Eating At Home & Out

The effect of income is evident in expenditures for food eaten at home and away from home. Expenditures for food at home actually dropped from the first to the second quarter of 1969. Of even greater importance to the shellfish market are expenditures for food away from home. These rose slightly in the second quarter, but were only 2% above a year ago. In effect, restaurant sales have held steady for nearly a year even though prices have increased.

Stretch Income by Cutting Food Spending

When inflationary pressures tend to hold incomes steady, or force declines, one way that consumers can stretch their incomes in the short run is to reduce food expenditures. Although the volume of food purchased may remain the same, a shift to lower-priced foods tends to hold total food expenditures about steady during a period of rising prices. Another quick way to stretch income is to cut down on restaurant eating. This strongly affects the shellfish market, which is primarily an institutional market.

Predictions for Coming Months

Consumption of shellfish in late summer and fall 1969 was expected to be a little lower than in 1968. Shellfish prices likely would continue above a year earlier during this period but might drop below end-of-August levels.

Fresh and frozen shrimp consumption was expected to be a little less than in August-October 1968. Shrimp landings in the southern states likely would be considerably less and shrimp imports would hold steady with a year ago. Inventories would continue above a year earlier. Even with an expected slight decline in supplies in the coming months, some downward adjustment in shrimp prices might occur to prevent too much inventory accumulation.

Sea Scallops

Sea scallop consumption was expected to remain low during August-October. Shorter supplies were not expected to offset generally weaker demand. This means that scallop prices would continue below 1968 levels.

Northern Lobster

Northern lobster consumption held about steady with a year earlier during first-half 1969. No increase was expected during the rest of the year; a slight decline might be in prospect. Northern lobster prices in recent months ran higher than last year. Prices probably would continue higher through the autumn, although prices likely would dip seasonally as larger supplies entered the market.

After a relatively large increase last year, spiny lobster tail consumption likely would drift lower this year, unless prices weakened substantially. Consumption was running about 10% behind a year ago. Prices and inventories were record high. Some price weakness was expected in light of the end-of-August inventories--even though imports drop seasonally in the fall.

BCF Seattle Scientists Invent Mechanical Scallop Shucker

Except for calico scallops, sea scallops are shucked manually at sea. This is a tedious, time-consuming, and generally unpleasant job. Since 1968, when serious commercial scallop fishing began in Alaska, the BCF Technology Laboratory in Seattle, Wash., has been working on the development of a mechanical shucking device to free the fisherman of this task.

A mechanical shucker must do several things. First, it must open the scallop; it must then remove the meat from the viscera or the viscera from the meat. If the viscera are removed first, the meat must finally be removed from the shell. The act of removing the meat must not damage it. The entire process must be rapid and sanitary, and the equipment should be economical of space and low in cost.

Working Model Developed

Scientists at the Seattle laboratory have developed a working model of a scallop opener and a device that removes the viscera from the meat. The inventors have applied for a patent to be assigned to the Department of the Interior. Persons interested in examining the prototype components from the point of view of manufacturing commercial equipment are invited to contact the laboratory at 2725 Montlake Blvd. East, Seattle, Wash., 98102.

New England Shrimp Fishery Is Growing

There is a growing market for northern shrimp (Pandalus borealis) found in various concentrations in the Gulf of Maine. BCF's Gloucester (Mass.) Exploratory Fishing and Gear Research Base has assisted the industry in developing this resource and finding commercial levels of concentration. The most promising areas are near Stellwagen Bank, Jeffrey's Ledge, and Nauset, Cape Cod.

Up to 50 small and medium-sized boats will work out of Gloucester this year to supply the demand. A new plant is planned for the state-owned Gloucester Fish Pier to handle up to 200,000 pounds of shrimp per day. About 100 persons will be employed to work in the cooking and freezing plant, plus 12 to 15 office workers.

A Hopeful Sign

This is a welcome reversal of the downward trend of recent years in the New England fishing industry. The shrimp boom is seen locally as a hopeful sign. The shrimp are available year round. Most vessel trips are 2 days and one night. Fishermen in Maine have successfully developed a market for the product cooked aboard vessel.

Maine's fishermen were first to go after this species. The shrimp are gaining in marketplace popularity at home and abroad. Some Gloucester-landed shrimp are being packaged for export to Europe.

Local fishermen are hoping that this new resource, along with pollock, may prove an alternative to the dwindling haddock resource.

Small Tuna Seiners Allowed Larger Incidental Yellowfin Catch

BCF has announced an increase in the incidental catch of yellowfin tuna permitted for small purse-seine vessels. It became effective August 22.

Under an amendment to yellowfin tuna regulations, tuna vessels using purse seines--and having a capacity of 300 short tons or less--may now retain a 40% incidental catch of yellowfin until a total of 4,000 short tons is taken by such vessels. Previously, the incidental yellowfin catch by these vessels was restricted to 30%.

Tuna Commission Recommendation

BCF's director said the Inter-American Tropical Tuna Commission had recommended that, during the 1969 season, the small tuna vessels of each nation fishing the regulated area should be allowed 4,000 tons after the regular yellowfin season closed.

The 30% incidental catch rate originally set by the U.S. proved too low. So it was adjusted upward to permit affected U.S. vessels

to use fully the 4,000-ton allotment. When this amount is reached, the small purse seiners will revert to the 15% incidental catch rate under which the remainder of the fleet is operating.

Tuna Fleet Carrying Capacity Increases

As of Sept. 1969, the carrying capacity of the U.S. tuna fleet had increased by about 6,500 tons--to around 54,100 tons. This was reported by BCF's Pacific Southwest Region. The 1969 fleet was joined by the 'Pacific Tradewinds,' 'Conquest,' 'Neptune,' 'Kerri M.,' 'Cheryl Marie,' 'Vivian Ann,' 'Queen Mary,' 'Mermaid,' 'Lou Jean II,' and 'Gina Karen.'

One other vessel, 'Kathleen,' is scheduled to join the fleet before the end of 1969. This will bring the total capacity of the U.S. fleet to about 54,600 tons, an increase of over 11,000 tons, or 20%, in 2 years. The increase in tonnage during 1969 was considerably greater than in 1968. Then, 4,060 tons of capacity were added; this brought fleet's carrying capacity to 47,660 tons.

When vessels now in the planning stages are considered, it is estimated that the U.S. fleet could be increased by another 4,000 to 5,000 tons in 1970.

Atlantic Activity

By mid-August, 24 U.S. flag purse seiners were fishing in, or had departed for, the eastern Atlantic Ocean off west coast of Africa to fish for tuna. Last year, there were 8 U.S. flag vessels fishing there.

Fishing has been reported fair to good. In mid-August, catches were being transshipped by refrigerated carrier vessels to Puerto Rico and California primarily, although some shipments reportedly were being made to Europe.

Bluefin Tuna Transit Pacific

Transpacific bluefin tuna migration has been reported by H. B. Clemens, California Fish & Game, and G. A. Flittner, BCF. Eight bluefin tuna, tagged and released in the California fishery, migrated westward across the Pacific Ocean. They were recaptured several years later near Japan.

Tagged bluefin, released near Japan and recaptured the following year in the California fishery, have migrated eastward across the Pacific. Clemens and Flittner point out that the bluefin probably undertake a regular migration across the north Pacific. Japanese and U.S. fishermen most likely are harvesting the same bluefin resource.

Japanese Method Tried in Saury Fishing

A chartered 100-foot whale catcher, the 'Dennis Gayle,' was used Aug. 13-19 to determine the suitability of the Japanese 'Boke Ami' (stick-held dip net) method for catching saury off California. The operation was led by Dr. Frank Hester, BCF Fishery-Oceanography Center, La Jolla, Calif.

Fishing was done between Point Reyes and Monterey, 40 to 100 miles off California. To attract and hold fish, three 8-foot light standards were mounted on the port (fish-gathering) side about 10 feet apart. Each standard had three 500-watt incandescent lamps housed in aluminum reflector bases. Half the lamps were equipped with blue filters; the other half were bare. A single 14-foot standard bearing three 500-watt lamp was mounted on the starboard (fishing) side; the outboard lamp was equipped with a red filter. A 2-kw. spotlight mounted on the bridge scanned the water's surface.

The trial dip net was constructed of $\frac{11}{16}$-inch nylon webbing, about 40-ft. wide and 20-ft. deep. Polyvinyl chloride pipe provided buoyancy and support; the bottom was weighted with chains and lead.

The Operation

With the ship underway, all lights were turned on at dusk. The spotlight swept over

the surface to induce saury to jump. When saury were sighted, the main engine was stopped and the starboard lights turned off. When large concentrations gathered under the port lights, the Boke Ami was lowered into the water on the starboard side. The starboard lights were turned on and the port lights extinguished. After the fish had aggregated under the starboard lights, the 2 white lamps were turned off. This left only the red lamp, which caused the fish to rise to the surface. As the fish were being brought aboard, the port lights were turned on again to gather more fish. Saury concentrated quickly under the lights, their numbers increasing with time. Small saury tended to stay on the surface, while larger saury stayed 5 to 10 feet below. Because of rough seas, the Boke Ami was used only at 3 stations, although saury were caught at all stations with a dip net. About 1,000 pounds of saury was caught during the cruise.

Effective But Expensive

It appears that the Boke Ami method is an effective means of catching saury. However, its commercial application in California may not be feasible because a large crew is required.

Flowing Sea Water Gives Best Growth of Oyster Spat

An experiment by BCF's Milford (Conn.) lab on the growth of oyster spat in different environments showed that those in raw, flowing sea water grew much faster than sibling spat in recirculated sea water to which food was added daily.

There was no difference in growth of spat in recirculated sea water fed X or 2 X quantities of food daily.

The growth of spat in the raw, flowing sea water was improved still more when X or 2 X quantities of food were added daily. These spat grew 2-2½ times as fast as those in recirculated sea water with the same amount of food added.

Iced Pacific Hake Tested in Making Kamaboko (Fish Paste)

Tests to determine the kamaboko-making properties of Pacific hake showed that fish kept on ice 7 days makes a superior kamaboko to that made from fish held on ice for one day. The tests were conducted by BCF's Seattle, Wash., Technological Laboratory.

When stored as surimi (a pulverized fish product) for 6 months at 0° F., kamaboko made from 7-day-iced fish retained most of its desirable elasticity; kamaboko from 1-day-iced fish lacked certain essential factors.

Better Understanding Needed

The researchers report sharp differences among different species of fish in their ability to form elastic gels. In some species, stale fish made better-grade kamaboko than fresh fish. This argues strongly, the researchers say, for a need to understand better the chemical and physical properties of actomyosin in different species--and how these properties change during storage, handling, and processing.

Restrictions on Walking Catfish Proposed

A proposal to amend regulations to restrict importation, transportation, or acquisition of live fish or viable eggs of the family Clariidae, after Dec. 31, 1969, was published in the "Federal Register," Aug. 19, 1969, by the Director, Bureau of Sport Fisheries and Wildlife.

Investigations by Interior Department have determined that the walking catfish, Clarias batrachus of the family Clariidae, competes with native fish for food and space. Clarias are virtually drought-resistant because they can estivate (spend summer in a torpid state), hibernate, or migrate overland to find water. Present fish-management practices have failed to control the spread of Clarias in Florida's fresh waters.

U.S. Agency Increases Efforts Against Fish Kills

The Federal Water Pollution Control Administration (FWPCA) is setting up a new program to report and investigate intensively fish kills caused by water pollution, FWPCA Commissioner David D. Dominick has announced.

He said: "The present voluntary program of reporting fish kills is no longer adequate in our stepped-up overall campaign against water pollution. The old system didn't provide for immediate reporting of fish kill incidents and didn't require any counter action by the FWPCA."

Under the new plan, FWPCA will participate actively in investigating fish kills, determining causes, and in providing technical help to control or prevent such kills.

Coast Guard Surveys Fishing Vessels

The U.S. Coast Guard has announced that a study of safety problems in fishing vessels has been underway for months. The study is entering a phase involving a physical survey of a sampling of vessels in U.S. fisheries.

The Coast Guard's concern arose from statistics indicating a consistently lower safety record for fishing vessels than for most other types of U.S. commercial vessels.

Survey's Purpose

The physical survey planned will attempt to "price out" safety standards to determine what improvements could be made that would be beneficial to the industry from a safety and financial viewpoint. The effect on insurance rates will be included. The Coast Guard has contracted for BCF assistance.

The Coast Guard emphasizes that it does not have preconceived ideas of what would be best for fishing vessels. It is looking to the industry for help.

U.S. Contributes $\frac{1}{3}$ to $\frac{1}{2}$ of Industrial Pollutants Found in World Oceans

The U.S. alone contributes from $\frac{1}{3}$ to $\frac{1}{2}$ of all industrial pollutants found in ocean waters, a speaker recently told scientists and students at the Virginia Institute of Marine Science, Gloucester Point, Va. The speaker was Dr. Edward D. Goldberg, Professor of Chemical Oceanography at Scripps Institution of Oceanography. Despite contamination of ocean waters by all industrialized nations, however, he is optimistic that the oceans will not become seriously polluted if proper controls are established in time.

Petroleum the Problem

Handling and using petroleum products is the key problem, according to Dr. Goldberg. "Petroleum products not only form the major basis for power and transportation, but they also provide the raw material for the synthetic chemical industries. Ninety-five percent of all organic chemicals originate from petroleum."

Dr. Goldberg pointed out that the introduction of lead tetra-ethyl into fuels has increased enormously the amount of lead byproducts in the air and water. "Although the percentage of lead added to the world ocean is small, we do not know its fate or how it may affect life in these waters. Lead has increased about 20 times that of the natural level in ocean surface waters in the last four decades."

Mercury's Impact

Dr. Goldberg said the real problem in disposing pollutants is to prevent their return to man. He cited mercury as an example. It is used as a catalyst in industrial chemical processes, electrodes in the chemical industry, and in pesticides. Between 5,000 and 10,000 tons of mercury are lost each year by agricultural and industrial users as stack gases and other wastes; much of it finally reaches the oceans.

Mercury's impact on the oceans was felt by the Japanese a few years ago. People in a coastal town were afflicted with "Minamata Bay disease." At first, doctors thought it was a new disease. Persons became seriously ill, palsied, blind, and bald. Fifty died. Later, it was determined that these people had been poisoned by the ingestion of methyl mercury chloride, a waste product from

manufacture of plastics. This had been concentrated by fish and shellfish--and had returned to man. The local government soon regulated the use and disposal of mercury contaminants.

Excellent Salmon Run at Kodiak, Alaska

A late-developing salmon run at Kodiak, Alaska, turned a predicted modest prospect into a 'phenomenal' run of pink salmon, reports BCF Juneau.

By late August 1969, more than 13 million salmon had been caught, perhaps the best odd-year run ever. Over 600,000 cases were produced. An estimate of salmon value was 50 cents per fish. No one could remember so large a catch so late in August.

Million In 1 Day

On Monday, Aug. 13, Kodiak fishermen caught a record one million pounds of salmon; a week later, Aug. 31, they caught 529,000 salmon.

Commercial Quantities of Geoduck Clams Found in Puget Sound, Wash.

Surveys conducted by the Washington State Department of Fisheries show that commercial quantities of geoduck clams exist in Puget Sound. These clams will be harvested by divers with hand-operated hydraulic equipment.

BCF's Seattle Marketing Office has informed local firms of the clams' availability and suggested their use in the firms' minced clam and chowder operations. Samples have been sent to a Seattle seafood company for testing and evaluation.

The Geoduck

The geoduck, Panope generosa, lives deep in the unshifting sand and mud bottoms of sheltered bays from Alaska to Mexico. It is usually found on the mean low water line, or somewhat below. It is the largest clam found in these bays. Individuals more than 8 inches long and weighing more than 10 pounds are not uncommon.

The geoduck lives in a semipermanent burrow often 3 or 4 feet below the surface; it sends its long siphon (tubular organ) upward. Any disturbance in its neighborhood causes the geoduck to partially withdraw its siphon. Further disturbance causes further retraction. But, because the geoduck's shells are not large enough, its siphons cannot be withdrawn completely into the shell.

The geoduck is comparatively safe from all enemies--except man. Contrary to popular belief, it is an extremely poor digger.

Maine Seeks Improved Method of Holding Sardines at Sea

The Maine Sardine Council is conducting a major experiment to develop an improved method for holding purse-seined herring (sardines) at sea. The work is being done from Port Clyde, Maine, in cooperation with the local canning company. The Council has bought new types of equipment being used extensively in Norway.

The Experiment

Freshly caught fish are transferred alive from purse seine to floating boxlike nets. The nets then are towed 6 to 24 hours to keep the fish in good shape and improve their condition while awaiting transportation to the cannery. This also frees the purse-seine catching boat for more fishing. If the tests are successful, the process could be used by the entire sardine industry. It could result in better use of the available supply of fish along the coast.

Veteran Norwegian fisherman Captain Arne Gronningsaeter is supervising the operation. The canning company is furnishing boats and crews.

ECONOMICS OF HAWAII'S SKIPJACK FISHING INDUSTRY IS EXAMINED

A study by Yung Cheng Shang of the University of Hawaii suggests that the slow growth of Hawaii's skipjack fishing industry is not due to overfishing. He indicates that industry profits--by themselves or compared to other industries--have been too low to induce new investment. His study is titled: "The Skipjack Industry in Hawaii: Some Economic Aspects," published by the university's Economic Research Center.

Mr. Shang says that the new state loan programs and higher exvessel prices of the last few years "hold some promise for the future of the industry." If present tuna prices and industry costs continue, "some investment might be forthcoming." However, costs are likely to rise.

Increasing costs could be offset by greater catches. If the increase proves substantial, however, "it will affect the price of tuna." How great an effect would depend on the potential of the several markets for skipjack.

The fresh-fish market in Hawaii has only a limited potential. Because of high shipping costs, it is not feasible to ship to U.S. west coast canneries. Possible alternatives are: substitution of Hawaiian catches for the frozen-tuna imports that feed the local canneries--and export of canned tuna to U.S. markets. But even with present higher cannery prices, and the state loan program, "the investment in a fishing vessel is not even marginally profitable. This again points out the crucial role that the productivity increase will play in determining the future of the industry in Hawaii."

THE INDUSTRY

Hawaii's commercial fishing industry accounted for about $\frac{1}{4}$ of 1% of the state's gross product in 1955; in 1967, about 0.12%. This was "not due to an absolute decline in the value of commercial catch but to a very rapid growth of other sectors of the economy."

Skipjack tuna are the largest part of the commercial fish catch: in 1965-67, 75% of the weight and about 48% of the value of marine catch. During the past 20 years, the amount and value of annual skipjack catch "have remained relatively stable": about 10 million pounds and $1.3 million. Between 1948 and 1968, the number of boats and fishermen has declined steadily: from 25 to 16 boats and 260 to 162 fishermen. This indicates some increase in catch per boat and per man.

During 1948-1967, frozen tuna imports into Hawaii "increased significantly." In the U.S., per-capita consumption of canned tuna rose from 0.9 pound in 1948 to 2.4 pounds in 1967. Neither increased productivity nor favorable demand induced investments to replace worn-out and sunken vessels during the past 14 years.

Noting that past research studies of commercial fishing were concerned primarily with biological aspects, Mr. Shang states: "While the solution of certain biological problems is crucial to the industry, it is widely recognized that economic aspects play an increasingly important role."

Fishing Methods

There are 3 techniques of tuna fishing: longline, purse-seine, and pole-and-line. The longline is used for tunas that live hundreds of feet down: albacore, yellowfin, bigeye, and bluefin--and such tunalike species as marlin and swordfish.

The longline is composed of baskets of gear. Each basket has a mainline section supporting branch lines. Each branch line has one hook. The longline itself is supported at the surface by glass or metal floats. Longlining is used in tropical and temperate waters.

Tuna in surface and near-surface tropical waters--skipjack, small yellowfin, and small bigeye--are caught mainly by purse-seining and pole-and-line. Purse-seiners are highly mechanized and have power blocks, nylon seines, and better facilities to carry fish. They can catch thousands of pounds at one time. This technique is used in the eastern tropical Pacific and in Japanese waters.

In Hawaii, the fishing gear is a bamboo pole, a line, and a hook that is part of the lure. The poles are 7.5 to 15 feet long. The shorter one catches fish over 20 pounds; the longer one, smaller fish. Pole-and-line or live-bait fishing is done fairly close to the continental coast and oceanic islands. It is the major Japanese technique for skipjack and albacore fishing.

The Boats

Hawaiian skipjack boats, "which have evolved from the Japanese sampans," are built of wood, 59.3-80.5 feet long, and are 29 to 77 gross tons. Diesel engines range from 135 to 400 horsepower. Sonar and mechanical

Fig. 1 - Skipjack (Katsuwonus pelamis).

Fig. 2 - This tiny silver fish--the nehu--feeds Hawaiian tuna industry. It is the bait.
(Warren R. Roll, Honolulu Star-Bulletin.)

Fig. 3 - Live-bait fishing for skipjack. Fish are breaking astern in vessel's wake. (H. Mann)

refrigeration are lacking. Each vessel has 6 baitwells, which also store fish. The crew is 6 to 12 men, depending on vessel size.

The Bait: Nehu

Live bait is used exclusively. It is predominantly the nehu, a small anchovy, 92-99% of all skipjack bait. The crew has to accumulate enough bait before scouting for skipjack. Nehu is found in estuarine areas, fairly uncommon in Hawaii. The nearness of certain baiting grounds is one reason why 12 of the 16 full-time skipjack vessels are based in Honolulu, Oahu.

The Operation

The vessels leave before dawn and, with daylight, begin to scout and fish. Bird flocks and water movements associated with the schools point to the schools. When a school is located, the vessels try to reach its head and the fishermen "chum" live bait to attract the fish close to the vessels. When fish follow a vessel's wake, they develop a "feeding frenzy" and attack anything that looks like bait. Standing shoulder to shoulder along the stern, each fisherman uses one pole to catch one fish as rapidly as he can. Only a small part of the school is caught. The vessels may run into several schools during the day. Darkness, or the absence of bait, ends scouting and fishing.

This operation has several problems; the bait problem probably is most serious. The fisherman spends about 30-40% of his time fishing for bait. This limits the number of trips. Also, the nehu is very delicate and about 30% die before the rest are used at sea. The nehu can live a few hours to a few days on the boats. It is one reason why fishermen work within 90 miles of coastline of the main islands. The need to replenish nehu also contributes to preventing trips to distant offshore grounds.

Search for Nehu Substitute

Attempts have been made to establish a source of bait fish that would be available without losing time. Marquesan sardine has been introduced into island waters, tilapia has been cultivated, and artificial bait tried (ineffective). BCF scientists have found threadfin shad comparable to nehu in luring tuna. It is hardy, stays alive for weeks, but it has not spawned in tanks. So there may not be enough to support a bait fishery.

Markets

Hawaii has 4 markets: a fresh-fish market, where fish are sold to consumer whole or filleted; a bait market for other fisheries; cured fish market, where fish is dried or smoked; and a cannery market.

BCF BEGINS MARICULTURE TRAINING PROGRAM FOR NORTHWEST INDIANS

Anthony J. Novotny

The Indians of the Pacific Northwest traditionally have lived near salt water, an important part of their rich heritage. At one time, the region's supply of marine products--halibut, salmon, crabs, and oysters--far exceeded the demand; the prosperity of the tribes was attributable directly to these resources. The art work of the Indians expresses the importance of these resources to the vigor of the tribal community.

The impact of non-Indian populations exploiting these same resources has been felt for about 200 years--most seriously in the past 50 to 75. Now, Indian and non-Indian alike use modern methods to harvest fish and shellfish, almost all destined for commercial sale. As demand frequently exceeds supply, it has become important to investigate every potential method for increasing the harvests of fishery products.

Lummi Indians

The Lummi Indian Reservation lies less than 15 miles from the Canadian border, in the northwest corner of Washington. Some 1,200 of about 1,600 members of the tribal community live there. About 90 percent of the Lummi families have incomes of less than $2,500 per year, mainly from salmon fishing on the reservation and on traditional fishing grounds nearby. In recent years, the total tribal income from salmon fishing has ranged from $100,000 to $200,000 per year. The income from other fishery resources has been much less.

The traditional dependence of the Lummi tribe on marine resources cannot be maintained without increasing the quantity of commercially important fish and shell fish. As the natural fishery resources outside the reservation are open to exploitation by Indian and non-Indian, one recourse is to increase the resources within the reservation. This can best be accomplished through mariculture (marine aquaculture).

Mariculture Has Merits

The reservation is a large tract of flat land bordering the Strait of Georgia. Many of its 7,600 acres are suitable for housing or commercial development; for the latter, the prime acreage is 5,000 acres of tidelands.

The Lummi Tribal Council is considering an imaginative project for developing the aquacultural potential of these tidelands. Primary emphasis will be on the culture of fish and shellfish of high economic value in a series of diked enclosures on the tidal flats.

BCF Provides Training

To support the Lummi tribe, the BCF Seattle (Wash.) Biological Laboratory is providing personnel and facilities to train Lummi youth. Guidelines are limited, and BCF scientists were given the responsibility for planning the training program.

We embarked on a program of maximum effort in practical training and experience, coupled with extensive assistance in continuing the formal education of locally accredited schools. Academic training would be given by BCF scientists whenever such training could be related directly to the trainees' possible future responsibilities. At every opportunity, they would participate in fishery research projects of BCF and the University of Washington to broaden their background and skills.

The Training Program

The experimental program began with four trainees. They were quartered on board the 115-foot BROWN BEAR, formerly an oceanographic research vessel, now converted into

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a floating maricultural laboratory. The vessel is moored in fresh water near the University of Washington's Fisheries Center and within walking distance of BCF's Seattle Biological Laboratory.

The trainees were started immediately on practices of fish culture with eggs of fall chinook salmon. The adult salmon reach the Seattle Biological Laboratory via a short, interconnecting waterway that discharges into Puget Sound. The trainees spawned the fish and transferred the fertilized eggs to incubators on board the BROWN BEAR. The approximately one-quarter-million eggs taken enabled the trainees to arrange a variety of experimental conditions during the incubation period. These experiments were demonstrably effective in stressing the importance of environmental conditions to the health, vigor, and survival of the developing embryos.

Fig. 1 - Lummi trainees check their newly hatched chinook salmon eggs. Temperature-controlled supplies of fresh or salt water can be pumped into all the laboratories of the BROWN BEAR.

Standard salmon cultural practices were used (fig. 1). Since formal education completed by the trainees averaged 10 years, considerable effort was put into on-the-job academic training that would apply directly to maricultural problems. The trainees were taught the International (Metric) System and its application to laboratory instruments. They were instructed in the rudiments of statistics and statistical applications, the use and significance of elementary graphs for plotting data, manipulation of analytical balances, vernier and other calipers, and other measuring devices, desk calculators, and the slide rule.

The trainees were taught to use anesthetics and prophylactic compounds for handling and treating fish. This training required instruction in proportionality and its application to weight, volume dilutions, and to practical experience in preparing anesthetic solutions and salt baths.

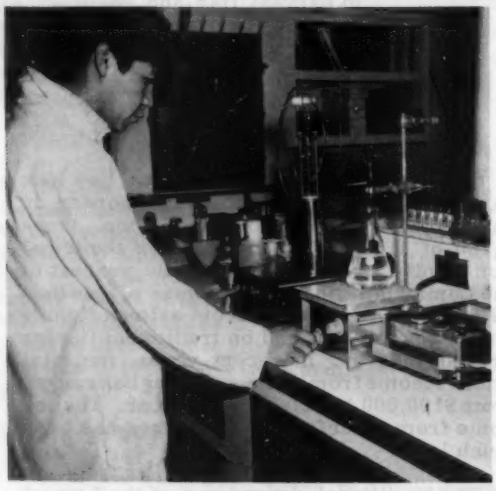


Fig. 2 - Trainee measures dissolved oxygen in floating laboratory's water supply. The training emphasizes learning to measure--and to understand importance of--the properties of water that are vital to the mariculturist.

They were instructed in water chemistry. Emphasis was on characteristics of water quality important to mariculture, such as dissolved oxygen, pH, ammonia nitrogen, phosphates, nitrates, turbidity, salinity, and alkalinity. Thorough experience was given in using analytical instruments and "cook-book" techniques (fig. 2) for spotting trouble with the quality of the water used in maricultural systems.

The phases of training in fresh-water salmon culture are now almost complete, and the BROWN BEAR will soon be moved to salt water. There, the trainees will get experience

in the salt-water acclimation of rainbow trout and salmon--and the culture of these highly desirable fish in salt-water pens and cages.

Training in shellfish culture was begun in late fall 1968. The trainees collected bay mussels in Puget Sound, Wash., at regular intervals and processed the samples. They are being taught how to measure and weigh shellfish to interpret growth patterns, and what to look for in gonad development. They are also being taught to collect plankton samples, to determine when bivalve larvae appear, and how to prepare artificial cultch material for collecting spat. BCF scientists are preparing to begin training in the culture of algae for feeding bivalves and bivalve larvae.

When the BROWN BEAR is moved to salt water, the trainees will learn to condition commercially important bivalves for spawning, the care and feeding of larvae, and the collection of spat on artificial cultch.

Other Work Experiences

The Lummi trainees have benefited from work experiences other than those given on the BROWN BEAR. One trainee spent 2½ weeks on the BCF research vessel MILLER FREEMAN off California assisting in the collection of plankton, learning how to operate large plankton nets, and to prepare plankton samples. More recently, two of the trainees have been working at the University of Washington with Professor Lauren Donaldson, a world-renowned authority on rainbow trout and salmon culture. Prof. Donaldson has been teaching them techniques for spawning trout, the care and incubation of trout eggs, preparing and handling eggs for shipment, "cold-branding" of salmon fingerlings, and good cultural practices.

When their training with Prof. Donaldson is completed, they will spend several days at the BCF Biometrics Institute, in Seattle, where they will be introduced to data processing. Although they will not be expected to acquire any specialized skills, they will be made aware of the labor-saving aspects of automatic data processing by working with IBM cards. They will start with simple card-sorting.

Some Problems But Progress Evident

Within 2 months after training began, it became evident that the trainees were not adequately prepared for the technical instruction. The scientists were not able to divert sufficient time from their regular duties to provide the guidance necessary to improve the trainees' comprehension. The number of trainees, therefore, was reduced to two. This reduced the training load for the scientists and increased personal contact, a factor that proved extremely important.

The Lummi Tribal Council reassigned one trainee to Peninsula Community College in Port Angeles, Wash., where he was enrolled in the Fisheries Technician program. The effectiveness of our training program was noted by one instructor there. He said that of five Lummi students enrolled, the one who had undergone 2 months' training with BCF was relatively advanced in technical competence and skills.

The cooperation of local school authorities in the training program has been outstanding. One trainee attends a local high school each morning, where he takes academic subjects required for graduation. The school authorities have arranged to give him elective credits for the work experience and academic instruction provided in the BCF training (called "Elements of Marine Science"). These credits will be applied toward his certification for graduation.

The training program is still highly experimental; it will be modified as the needs of the Lummi Aquaculture Project become evident. Plans are being made to include the training of Lummi women; it is expected that their involvement will encourage family participation and increase the stability of the project.

U.S. Fishery Jurisdiction

U.S. territorial waters are 3 miles--but fishery jurisdiction extends an additional 9 miles.

Fishery Statistics Program Is Set Up in Puerto Rico

The first commercial marine fisheries statistics program for Puerto Rico has been established. It was the work of the Division of Fish and Wildlife, Department of Agriculture, Commonwealth of Puerto Rico, assisted by the Institute of Marine and Atmospheric Sciences, University of Miami, Miami, Florida. Bureau of Commercial Fisheries Public Law 88-309 funds were used.

Development of the program began in July 1967 and reliable statistics were being obtained by August 1968. A fish ticket system similar to the one used in developing the Florida fisheries statistics program was recommended by the Institute and is presently in use. The data are processed by the Office of Agricultural Statistics of the Department of Agriculture.

Preliminary Estimates

Preliminary estimates place the minimum annual production near 3 million pounds, valued at nearly 800 thousand dollars to the fishermen. Landings are highest on the island's west coast (42% by weight, 35% by value) and lowest on the north coast (10% by weight, 14% by value). The east coast produces 23% by weight and 25% by value, and the south coast 25% by weight and 26% by value.

Finfish represent 87% of the landings by weight and 72% by value. Snappers, mackerels, and groupers are the most important commercial fish species. Lobsters (mostly spiny lobster, but including some sand lobsters) constitute 9% of the total landings by weight and 22% by value; these have the highest average exvessel price, $0.73 per pound, of all fish and shellfish landed in Puerto Rico. Land crab represents less than 1% of the landings by weight and value, but at $0.67 per pound, it is also a relatively high priced item. The overall average exvessel price for fish and shellfish is $0.28 per pound.

--Charles W. Caillouet Jr.
U. of Miami

Charter sloop sails tradewinds from St. Croix to Buck Island, Virgin Islands. (Photo: M.W. Williams)

House Streamlines Fishing Fleet Improvement Act

To speed renewal and modernization of the aging U.S. commercial fishing fleet, the House of Representatives has passed a bill amending the Fishing Fleet Improvement Act.

The bill, H.R. 4813, would simplify the granting of subsidies for new construction, and provide, for the first time, subsidies for reconstruction of existing vessels.

Amendments in H.R. 4813 would:

1) extend the construction assistance program until July 30, 1971;

2) provide subsidies of not more than 35% for vessel reconditioning, conversion, and rebuilding;

3) increase yearly appropriation authorization from $10 to $20 million;

4) base amount of subsidy, both for remodeling and new construction, on the difference between foreign and domestic costs for a class of similar vessels--instead of continuing to require a separate determination for each vessel;

5) eliminate several time-consuming procedures and administrative costs;

6) authorize study of ways to improve effectiveness of the U.S. fishing industry.

Need for Legislation

Urging passage, Rep. Pelly (Wash.) said:

"A modern fishing boat in a U.S. shipyard is a very substantial investment. For example, the cheapest boat constructed. . .since the 1964 amendment, cost over $230,000. Many of them were over $500,000, and several cost in the millions. For the average fishing boat operator, the construction of a vessel of this size and complexity is simply out of the question."

This bill provides subsidies for rebuilding and modernizing existing vessels, Rep. Pelly explained, "so that a vessel operator may improve the efficiency of his fleet without the staggering burden of constructing completely new ships."

Appropriation Increase Limited

It would take an estimated $30 million a year in Federal funds for 7 years to significantly modernize the U.S. fishing fleet. The authorization, however, has been limited to $20 million a year for 1970 and 1971. By 1971, Rep. Pelly believes, "we should be in a position to study the effect of the changes we are now considering. Hopefully, they will prove to have been an effective aid. . .and will justify a further commitment to complete the modernization of this. . .industry."

Simplified Procedures Were Needed

Rep. Pelly considers that previous legislation has been hindered by the "fact that the complicated hearing and administrative procedures of the Maritime Administration were adopted as the guidelines for the granting of subsidy applications." While these may be desirable in the construction of cargo liners costing $15 to $20 million each, he feels "they are an unnecessary burden and expense for small companies in the fishing business."

New Methods Eliminate Uncertainties

The Congressman added:

". . .due to the procedures for determining foreign shipbuilding costs many fishing-boat owners could not find out how much subsidy actually would be paid until after they had committed themselves. The amount of money they would have to raise to cover their share of the cost was always in doubt, pending certification by the Maritime Administration of the cost of building a comparable vessel in a foreign yard.

"No longer will the Maritime Administrator be required to determine the foreign costs of building each vessel for which subsidy is requested. Under this legislation, the Maritime Administrator will only be required to make periodic general surveys of the cost of building representative classes of vessels in foreign yards. These cost determinations will be a matter of public record so that applicants will be able to determine in advance how much assistance they can expect if their application is approved."

Minimum Construction Subsidies

Speaking for H.R. 4813, Rep. Feighan (Ohio) said: "It is anticipated that small

fishing craft operators should benefit substantially. . .from this bill, because of a new guarantee to receive a minimum subsidy of 35% for the construction of new fishing vessels. Heretofore, an applicant for a subsidy could never be certain of the amount he would receive until the 6 month's application period was completed."

Public Hearings No Longer Mandatory

The amendments end the requirement for a mandatory public hearing on each application.

"Every application approved since 1964 has involved a formal hearing before a hearing examiner" explained Rep. Dingell (Mich.). "Except for a few cases, most of the hearings have been quite pro forma, since there was no one to speak in opposition to the application. By providing everyone with an opportunity to request a hearing equal results would be obtained, with a smaller expenditure of time and money."

Trade-In Subsidies Discussed

Although he favored passage, Rep. Van Derlin (Calif.) voiced concern about the continued exclusion of vessel trade-ins from the program. He feels this omission may discriminate against those already in the fishing business who are trying to operate obsolescent boats. He believes they should receive more of the subsidy benefits already available to industry newcomers. The latter do not have to worry about unloading an aging boat to obtain a new one.

He noted that H.R. 4813 has tried to cope with this problem by authorizing a study that will include consideration of vessel trade-in subsidies.

Areas to be Studied

Discussing the proposed study, Rep. Keith (Mass.) said: "We have been trying to help the fishing fleet regain its proper position ever since I have been a Member of the Congress, and for many years before that.

"I think, perhaps, the most unique step in our current effort to solve this problem is in this legislation. . .a study under the leadership of the Secretary of the Interior, in consultation with the Maritime Administration, other interested Federal agencies, and professional and industrial organizations knowledgeable about U.S. commercial fishing vessels and their operation.

"The first area is that of insurance. It costs about $800 per man for insurance premiums alone for a fishing vessel to put to sea. In some nations. . .they do not have any insurance. In other nations--Canada, for example--they subsidize the cost of this insurance, and the net cost per man is around $200 per year."

Rep. Keith described 4 other areas to be studied: improvements and innovations in vessel and equipment design; trade-ins; improvement of safety and efficiency of existing vessels; and possibility of a construction reserve fund similar to that given the merchant fleet. There, owners are allowed to set aside reserves against vessel depreciation.

--Barbara Lundy

OCEANOGRAPHY

Microscopic Organisms May Help Clean Up Oil Spills

The use of microscopic organisms to help clean up oil spills is being studied by oceanographers of Florida State University. They plan to collect and study bacteria and other tiny organisms that oxidize and decompose small quantities of oil in polluted harbor waters and shorelines. They have observed that certain bacteria may speed the natural decomposition of oil that often fouls water and beaches.

At St. Marks, Fla., the eastern terminus of the Gulf's Intracoastal Waterway, bacteria have reduced or cleaned minor spills from oil barges and other craft.

Federal Grant

The scientists have received a $105,000 grant from the Federal Water Pollution Control Administration to collect from around the world microorganisms that keep minor oil spillages from fouling the water.

Dr. Carl Oppenheimer, director of Florida State's shore facility, said: "We know that this method by itself could not clear up a spill of say 100,000 barrels, but it could significantly speed up clearing the last portions, which sometimes linger on shorelines for years."

Mechanical methods could be used first to clear away most of the spilled oil. Then the organisms would finish the job.

So far, the oceanographers have observed organisms that attack the oil at the molecular level. They break the oil's hydrocarbon molecules into smaller and smaller units; eventually, they oxidize the oil into carbon dioxide.

U.S. and Florida Are Mapping State's Sea Boundaries

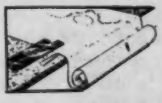
ESSA's Coast and Geodetic Survey (CGS) and the Florida Department of Natural Resources are working together to map the state's seaward boundaries. At stake is ownership of coastal and offshore lands which, at one time or other, are covered by the tide.

The problem involves a determination of federal, state, and private boundaries, ESSA states. In coastal areas, the mean high-water line generally marks the boundary between state and private property--whereas the mean low-water line is the base line, or starting point, for determining the limits between U.S. and state ownership. In Florida, state ownership starts at the mean high-water line and extends offshore 3 miles beyond the mean low-water line along the Atlantic coast--and 9 miles along the gulf coast.

5-Year Program

Costs of the 5-year program will be shared by the U.S. and Florida. Randolph Hodges, executive director, Florida Department of Natural Resources, hailed the program as "a major milestone in the history of our state. Valuable oil, gas and mineral reserves may well exist offshore. Frequently we learn of valuable recoveries of salvage materials from sunken vessels. These, together with the commercial and sport fisheries and marine nursery grounds, constitute a valuable asset."

Hodges said that although Congress has established the intended legal definition of Florida's boundaries along the Atlantic shores--and the Supreme Court for Gulf of Mexico waters--nevertheless controversy may continue until the state's seaward boundaries are determined.



States' Seaward Boundaries Not Accurately Determined

Rear Adm. Don A. Jones, director of ESSA's Coast and Geodetic Survey (CGS), said on Sept. 10 that the seaward boundaries between states have not been accurately determined. He noted the need to define these legal limits because of their increasing economic importance. He spoke at the annual meeting of the American Shore and Beach Preservation Association in Atlantic City, N.J.

Adm. Jones revealed that most states have not laid claim to as much ocean space as Congress has authorized. Although the national domain extends only 3 miles from shore, the Geneva Conventions (adopted in 1958 and ratified by U.S. in 1964) pushed U.S. economic boundaries (and thus the states') as far out to sea as land beneath it could be exploited economically.

New Significance

Adm. Jones declared: "The coastal zone is acquiring a new significance as the nation enters into a new phase of national interest in the sea. Accelerated development and growth of the use of the sea indicates the extent to which it will be exploited to the benefit of commerce, industry, recreation, and settlement."

"Some day," he predicted, "aquaculture may well rival and surpass agriculture in importance as the population growth imposes an increasing dependence upon the marine environment."

The ESSA official said an expanded national effort must be made "if our technology is to be used effectively in making intelligent use of our oceanic frontier. . .Among the basic problems now being encountered is the determination of the extent of offshore waters over which a maritime nation has sovereignty. Ownership of rights to the ocean floor, state-federal jurisdiction, the extent of fishing rights, and other factors are pressing problems."

The Admiral concluded: "Until recent years there seemed to be no need on the part of coastal states to claim ocean space." But rapid developments in the coastal zone and on submerged Continental Shelf now make it "increasingly imperative" that CGS accelerate its traditional shore-and-sea boundary program specifically for boundary purposes.

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Alcoa Is Building Deep-Ocean Search & Recovery Vessel

Aluminum Company of America is building the "largest and most advanced deep-ocean search and recovery vessel ever designed." The work is being done by Peterson Builders of Sturgeon Bay, Wisc. The ship, the 'Alcoa Seaprobe,' will be operated by Ocean Search, Inc., a joint venture of Alcoa and Ocean Science and Engineering, Inc.

The 244-foot, all-aluminum craft will be capable of recovering 200-ton payloads from 6,000-foot depths. It is expected to be fitted out and ready for sea trials early in 1971.

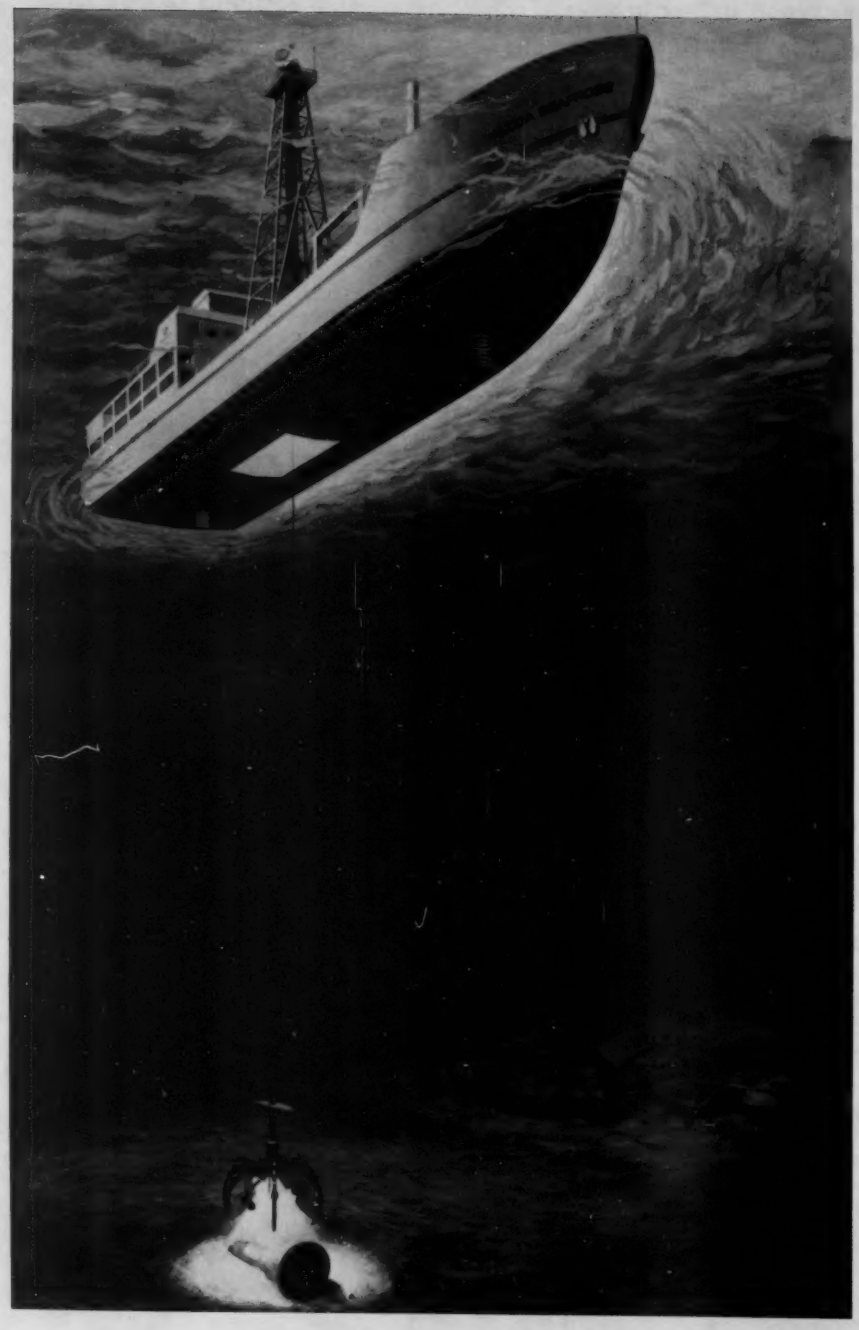
The Vessel

The vessel will have a 50-foot beam, 9-foot draft, and 2,000-ton displacement. Alcoa says: "It will possess the ability to hold its position in rough seas; search, core and sample mineral deposits on the sea floor; locate and retrieve heavy objects more than a mile beneath the surface; and to perform other research and exploratory oceanographic functions. No existing or proposed ship has anything approaching these capabilities."

The vessel's hull and superstructure will be of Alcoa-developed aluminum marine alloys. It will be powered by diesel electric generators giving it a 10,000-mile, 45-day cruising range. It will be equipped with "the most advanced communication navigation and search equipment available."

Its Missions

The kinds of missions the vessel will be given have not yet been determined. However, these are expected to include "deep-sea recovery work, deep-ocean archeological projects, and proprietary undersea geological explorations. . . ." The ship also will be available to assist in searching and recovering missing submarines or other objects.



Scripps' Newest, the 'Melville,' Nearly Ready for Work

The newest U.S. oceanographic research vessel, the 245-foot, 2,075-ton Melville left Defoe Shipbuilding Co., Bay City, Mich., Sept. 2 for San Diego, Calif., and use by Scripps Institution of Oceanography. She was scheduled to arrive in late October.

The Melville paid a 2-day courtesy call on Woods Hole (Mass.) Oceanographic Institution (WHOI). A sister ship of the Melville, the 'Knorr,' is being built by Defoe for WHOI. She is scheduled for delivery later this year.

The Melville then proceeded to the Bahama Islands area for 2 weeks of intensive sea tests and trials.

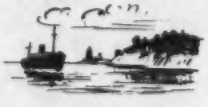
Bahama Tests

The Bahama trials will provide extensive testing of the ship's machinery, especially winches and other deep-sea gear. Tested too will be her maneuverability with a new type of propulsion that enables her to move forward, backward, or sideways, or remain stationary over a fixed point in 35-knot winds and heavy seas.

This propulsion system uses vertically mounted, multibladed, cycloidal propellers, one at the bow and one at the stern. Although this system was U.S.-designed, its use is relatively new here. It has been used in Europe for more than 30 years.

The Melville

The Melville was built at an estimated cost of $7 million, including equipment. She has a maximum capacity of 62 scientists, technicians, and crew members. She and the Knorr were constructed under an $11.8 million, 2-ship, contract, excluding equipment.



'Franklin' Scientists 'Amazed' by Fish Abundance Off New Jersey

During the 30-day Gulf Stream Drift Mission of the 146-ton 'Ben Franklin' that ended in August, the crew saw relatively little marine life. But in September, during a 24-hour research dive 81 miles southeast of Atlantic City, New Jersey, scientists aboard the Franklin were "amazed" by the abundance of fish surrounding the submerged vehicle.

Also, the crew reported, findings 'hint' that a new seamount exists off the Jersey coast.

New Maps Show Subsea Mineral Areas

Four new maps showing the world distribution of known and potential subsea mineral resources have been published by the U.S. Geological Survey, Department of the Interior. The maps are supplemented by a 17-page pamphlet that describes subsea geologic features and reviews the magnitude and potential usefulness of seabed resources.

The maps were prepared at the request of the National Council on Marine Resources and Engineering Development. They are part of the U.S. government's effort to assemble basic information helpful to U.S. and foreign officials concerned with seabed exploration and development.

Dr. Vincent E. McKelvey and Dr. Frank F.H. Wang, authors of the maps and report, note that subsea petroleum (oil and gas), produced offshore by 25 countries, contributes 17% of world's output. It makes up nearly 90% of total value of current subsea mineral production.

The maps and pamphlet, "World Subsea Mineral Resources," are published as Miscellaneous Geologic Investigations Map I-632. They are available for $2.75 the set (maps not sold separately) from Distribution Branch, U.S. Geological Survey, 1200 South Eads Street, Arlington, Virginia, 22202; the Federal Center, Denver, Colorado; and Fairbanks, Alaska, 99701.

Foreign Fishing Off U.S. in July-August

OFF NEW ENGLAND & ON GEORGES BANK

Fog and haze restricted surveillance in July, but good weather in August permitted excellent coverage.

In July, about 175 vessels (150 in June); in August, 325 from 10 countries, perhaps the most in 1 month since summer 1963, when a far-less-modern, 300-400-vessel Soviet fleet fished off New England.

Soviet: Fleet in same general areas, June, July, and August. In August, 212 vessels--39 factory stern trawlers, 152 medium side trawlers, 8 factory base ships, 12 refrigerated transports and cargo vessels, and 1 tanker (118 in August 1968).

Polish: In June, 3 vessels; July, 18; August, 37--28 side and 4 stern trawlers, 4 carriers, and 1 factory base ship.

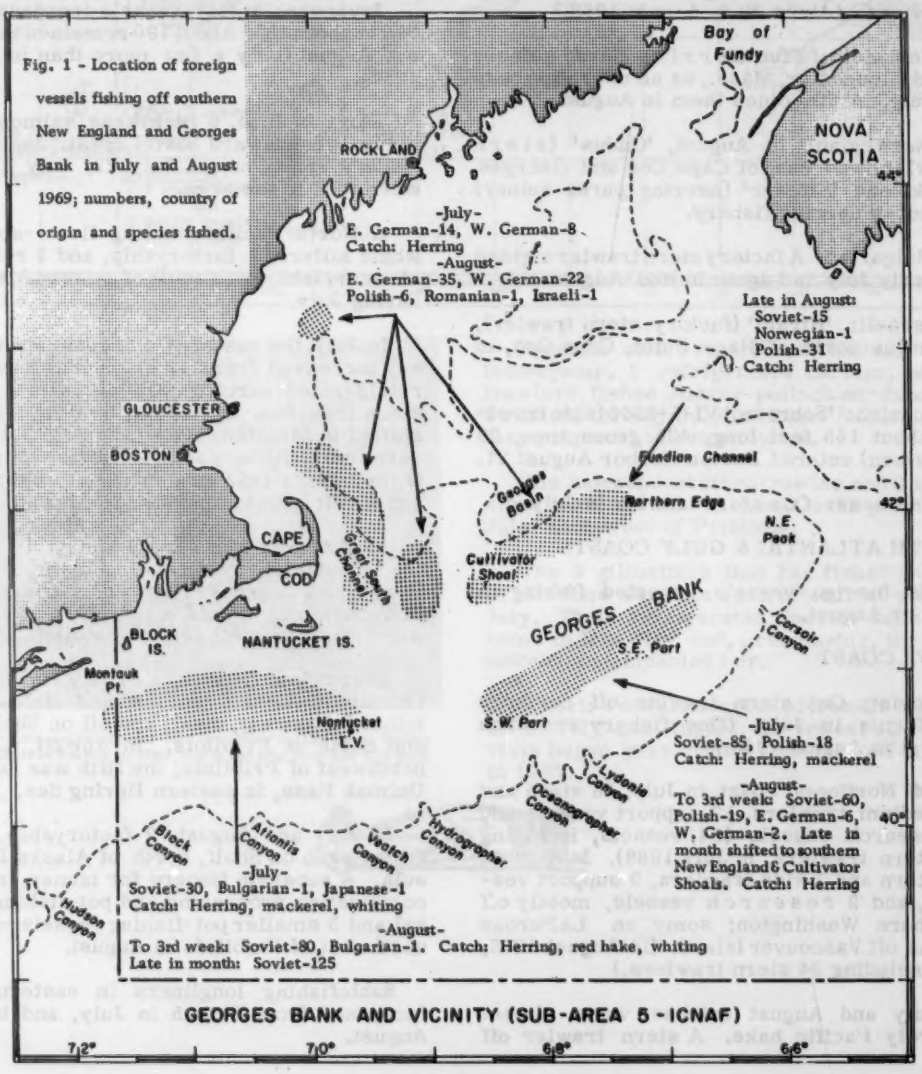


Fig. 1 - Location of foreign vessels fishing off southern New England and Georges Bank in July and August 1969; numbers, country of origin and species fished.

East German: In July, the base ship 'Junge Garde' and 14 vessels; in August, 40--27 factory and freezer stern trawlers, 11 side trawlers, and 2 factory base ships (31 in August 1968).

West German: In July, the fisheries enforcement vessel 'Frithjof' and over 10 trawlers; in August, 22 freezer stern trawlers and 2 fishery protection vessels. The latter provide medical aid, technical assistance, towing and salvage, and meteorological services. (About 29 in August 1968.)

Icelandic: Five herring purse seiners used Gloucester, Mass., as an operation base in July. A 6th joined them in August.

Norwegian: In August, 'Gadus' (stern trawler) was east of Cape Cod and Georges Bank, and 'Kloster' (herring purse seiner) explored herring fishery.

Bulgarian: A factory stern trawler sighted in early July and again in mid-August.

Israeli: 'Hiram' (factory stern trawler), 20 miles north of Race Point, Cape Cod, in July.

Spanish: 'Sobroso,' VI-5-8380 (side trawler about 165 feet long, 425 gross tons, 26 crewmen) entered Boston Harbor August 21.

Japanese: One stern trawler in July.

SOUTH ATLANTIC & GULF COASTS

No foreign vessels reported fishing in July or August.

WEST COAST

Soviet: One stern trawler off northern California in July. (One fishery research vessel in August 1968.)

Off Northwest coast, in July, 38 stern and 9 medium trawlers, 12 support vessels and 4 research vessels (54 vessels, including 37 stern trawlers, in July 1968). In August, 37 stern and 7 side trawlers, 9 support vessels, and 2 research vessels, mostly off northern Washington; some on LaPerous Banks off Vancouver Island. (In August 1968, 49, including 34 stern trawlers.)

July and August catches were almost entirely Pacific hake. A stern trawler off Vancouver Island and Cape Flattery caught almost 30,000 pounds in a single haul.

Japanese: In late July, 1 longliner off Washington; in August, 2 longliners and 1 stern trawler. One longliner caught about 5,000 pounds of ocean perch. Early in August, a longliner was taking black cod on almost every hook. (Two longliners in August 1968.)

ALASKAN COASTS

Japanese: In July, vessels decreased from 390 to about 185. About 190 remained throughout August (only a few more than in August 1968).

Early in June, 6 high-seas salmon fleets moved west toward Soviet coast. Just before fishery ended, about July 22, only 3 fleets were still in the area.

A North Pacific whaling fleet--about 12 whale killers, 1 factoryship, and 2 refrigerated carriers--was south of eastern Aleutians during July.

In July, the eastern Gulf ocean perch fishery increased from 12 stern trawlers and 1 refrigerated carrier to 20 trawlers and 2 stern trawlers. In August, 3 of the trawlers shifted to Albatross Bank in central Gulf. The ocean perch fishery along Aleutians increased from 2 stern trawlers in July to 6 trawlers and 1 refrigerated carrier in August.

As the Gulf ocean perch fishery increased, the groundfishery along Shelf edge in the Bering Sea decreased from 20 vessels to 12. In August, these 12 and a refrigerated carrier were south to northwest of Pribilofs.

Throughout July, 5 factoryship fleets trawled Alaska pollock and flatfish for minced-fishmeat, meal, and oil on Shelf east and north of Pribilofs. In August, 4 were northwest of Pribilofs; the fifth was north of Unimak Pass, in eastern Bering Sea.

In July and August, 2 factoryship fleets fished crab on Shelf, north of Alaska Peninsula. A separate fishery for tanner crab--1 combination processing and pot-fishing vessel and 3 smaller pot-fishing vessels--began northwest of Pribilofs in August.

Sablefishing longliners in eastern Gulf increased from 2 to 5 in July, and to 8 in August.

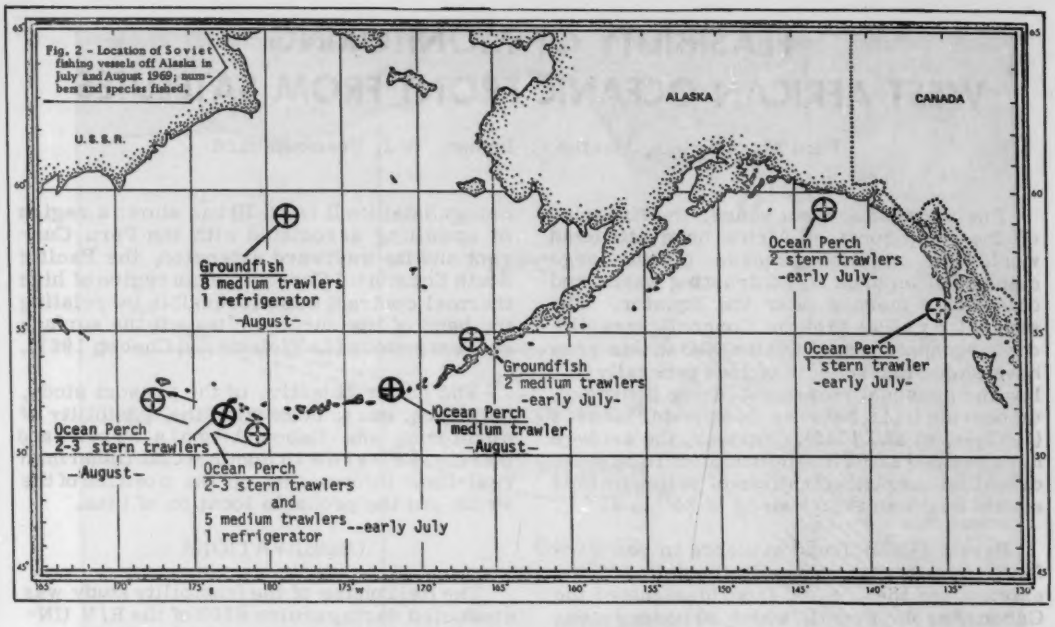


Fig. 3 - Korean stern trawler 'Keo Mun #501' fishing in the Bering Sea. Built in France in 1966, she is 106 feet long and 223 gross tons.

Republic of Korea (South Korea): One factoryship, 1 refrigerated carrier, and 7 trawlers fished Alaska pollock northeast of Pribilofs through July until late August, when they prepared to return home.

One independent stern trawler and 2 small stern trawlers also fished Alaska pollock in July, southwest of Pribilofs.

The 5 gillnetters that had fished salmon in late June were not seen after first week of July. Their refrigerated carrier sailed for home in late July and, presumably, the gillnetters accompanied her.

Soviet: Vessels decreased from 20 to about 12 in July and August, the fewest since Soviets began year-round fisheries off Alaska in 1963.

ARTICLES

FEASIBILITY OF MONITORING WEST AFRICAN OCEANIC FRONT FROM SATELLITES

Paul M. Maughan, Merton C. Ingham, & J. Frank Hebard

For the past several years, the fisheries off the west coast of Africa have attracted worldwide attention because of the large catches in an area of contrasting warm and cold water masses near the Equator. The several cruises of the Congo-Brazzaville oceanographic vessel OMBANGO in this area have shown that schools of tuna generally follow the seasonal movement of the boundary, or oceanic front, between these water masses (LeGuen, et al., 1965). Further, the cruises have yielded sufficient information to hypothesize that the concentrations of yellowfin tuna should be greatest in waters of 24° to 25° C.

Berrit (1962) found evidence in sea-surface temperature and salinity data for the existence of the oceanic front (designated the Gabon-Angola Front), which appeared seasonally between 16° S. latitude and the Equator along the west coast of Africa (Fig. 1). This finding followed considerable research in the area east of approximately 5° W. longitude by Berrit (1959) and others.

Advances in the use of earth-orbiting satellites for earth resources observation led to the concept of using a satellite system to monitor the position of the Gabon-Angola Front. Previously, two satellite-mounted sensors, one operating in the infrared (IR) wavelength region and the other in the visible wavelength region, have delineated well-known oceanographic features. Wilkerson (1967) has shown that certain features related to the Gulf Stream are discernible from IR data relayed to earth from experimental NIMBUS satellites. He obtained TV-pictures that clearly outlined the western edge of the Gulf Stream and indicated the presence of warm Gulf Stream water moving alongside the colder shelf water.

More recently, a TV-picture in the visible wavelength region from the Application Technology Satellite II (ATS II) has shown a region of upwelling associated with the Peru Current and its westward extension, the Pacific South Equatorial Current. This region of high thermal contrast was discernible by relating the band of low surface clouds to the surface current pattern (LaViolette and Chabot, 1967).

The major objective of the present study, therefore, was to determine the feasibility of monitoring the Gabon-Angola Front--and thereby provide to commercial fishermen real-time information on the position of the Front and the probable location of tuna.

OBSERVATIONS

The field phase of the feasibility study was conducted during cruise 6802 of the R/V UNDAUNTED (BCF Miami) in west African waters from September 19 to November 22, 1968. An Automatic Picture Transmission system, capable of receiving and photographing images from both visible and IR sensors mounted on satellites, was used on the vessel to acquire satellite data. At the time of the study only the ESSA-6 weather satellite was operational and only in the visible mode (no IR sensor was carried aboard ESSA-6), so no IR data were acquired. Surface truth data, both oceanographic and meteorological, were obtained on the UNDAUNTED for association with the satellite data.

The satellite TV-picture receiving equipment on board the UNDAUNTED, which was activated for 37 orbits, yielded 123 photographs from the ESSA-6 weather satellite during the cruise. The number of photographs received during an orbital overpass depended on the length of time the satellite was above the horizon as "seen" by the receiving antenna on the vessel. Each picture transmission required 3.4 minutes plus a 2.4-minute synchronization period between transmissions;

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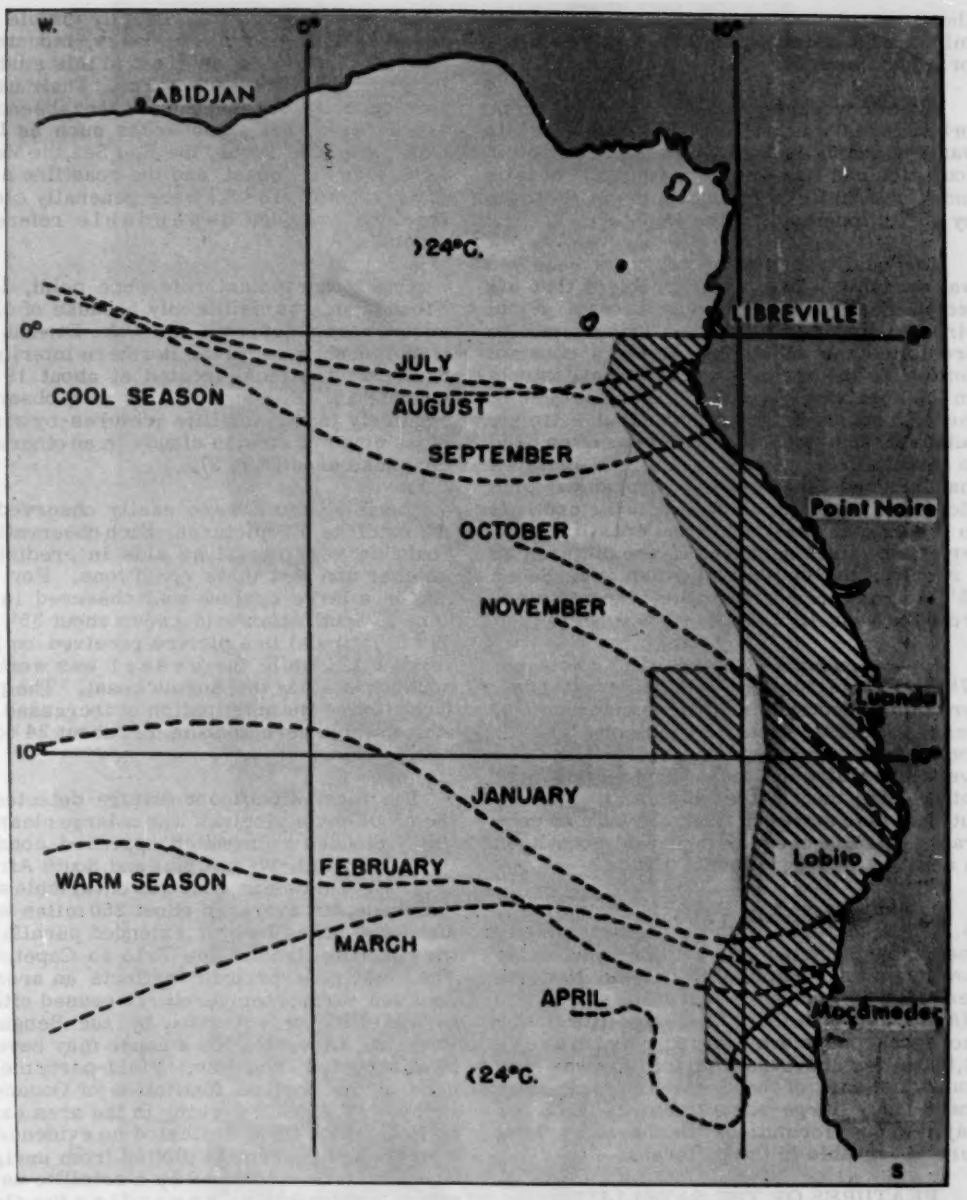

Fig. 1 - Seasonal movement of the Gabon-Angola Front associated with the 24° C. isotherm. Survey areas for R/V UNDAUNTED Cruise 6802 are hatched.

thus one picture was received for each 6 minutes the satellite was above the horizon, or a maximum of four pictures per orbit.

Areal coverage of the TV-pictures in an orbital pass was extensive. In some orbits passing nearly overhead, the area covered in four pictures was approximately 80° of latitude (from Sicily to a point south of Capetown) by 25° of longitude (at the Equator).

The quality of the photographs received was variable. The major problem that affected quality was the variation of signal strength between orbits. This fluctuation prohibited the establishment of a constant setting for the intensity and contrast controls on the receiver. Operator experience led to more frequent acceptable control settings, but the first picture of an orbit was often used to establish the proper setting. In pictures that included large areas of broken cumulus clouds, it was difficult to adjust the contrast to reveal both cloud detail and coastline. Interference lines appeared in the pictures as a result of the ship's roll (when it exceeded 15°) and as a result of radio transmissions from the vessel.

To supplement the shipboard TV-pictures, 276 ESSA-6 pictures of African coastal waters during September 15-December 1, 1968, were purchased from the Mulemba Astronomical Observatory, Luanda, Angola. The average quality of these photographs was better than that of the shipboard pictures, but they also suffered from the lack of contrast control necessary to reveal coastlines in areas of broken cumulus clouds.

In addition to the ESSA-6 TV-pictures, 15 ATS III pictures of the southeast Atlantic Ocean taken during late October and early November were obtained from the National Aeronautics and Space Administration (NASA). Because the ATS III satellite is in a geo-synchronous orbit at approximately 22,000 miles above the Equator, and was stationed just east of the South American continent, only large-scale features such as major cloud formations in the study area were observable in the pictures.

FEATURES OF THE SATELLITE PICTURES

The features revealed by the satellite TV-pictures can be separated into two groups--those directly visible, and those manifested by cloud patterns. The directly visible features include coastlines, lakes, mountains, and islands--all of interest in this study as geographical reference points. Their use in this capacity depended upon the absence of cloud cover, but some areas such as Lake Chad, the Nile River, the Red Sea, the Mediterranean Sea coast, and the coastline south of Cape Frio (18° S.) were generally cloud-free and provided dependable reference points.

One geographical reference point, Lake Etosha Pan, was visible only because of cloud cover associated with it. Lake Etosha Pan is a marsh area in the northern interior of South-West Africa, located at about 19° S. latitude 16° E. longitude. It was observed regularly in the satellite pictures by virtue of its cover of stratus clouds in an otherwise cloudless area (Fig. 2).

Storm systems were easily observed in the satellite TV-pictures. Such observations could be very useful as aids in predicting weather and sea state conditions. For example, a large cyclone was observed in the central South Atlantic (between about 35° and 50° S. latitude) in a picture received on November 12, while the vessel was working southward along the Angola coast. The picture allowed the anticipation of increased sea states which were encountered about 24 to 48 hours later.

The most significant feature detected in the cloud cover pictures was a large clear or thinly clouded area which appeared consistently off South-West Africa and South Africa (Fig. 3). This clear zone was of variable size and shape, but averaged about 250 miles wide and 1,200 miles long; it extended parallel to the coastline from Cape Frio to Capetown. The clear zone probably reflects an area of cool sea surface temperatures caused either by upwelling or advection by the Benguela Current. (Advection as a cause may have to be discounted, however. Field-party members of the Scripps Institution of Oceanography R/V ARGO, working in the area early in November 1968, indicated no evidence of a northward current as plotted from navigational offsets calculated by a satellite navigation system.) Data regarding the clear zone were not acquired by the UNDAUNTED because the vessel did not work that far south.

No cloud features were detected in the satellite pictures which could be associated

Fig. 2 - Mosaic of typical ESSA-6 weather satellite TV-pictures received during UNDAUNTED Cruise 6802 showing important geographical features. Dark swath on outline map shows surface area covered by mosaic.

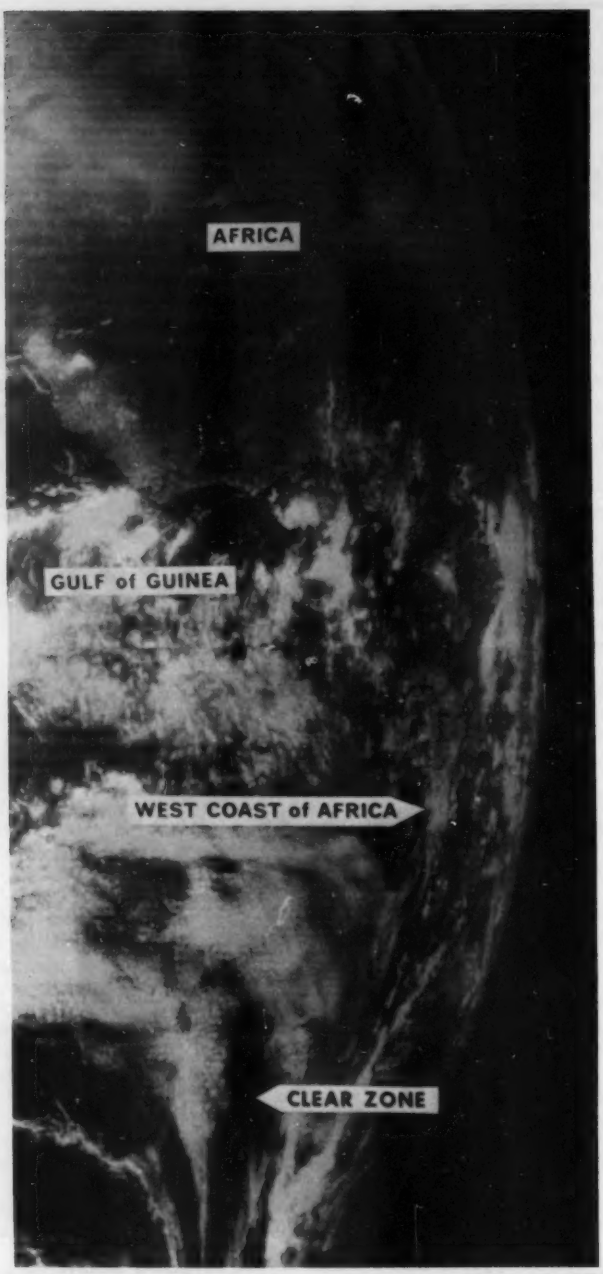

Fig. 3 - ATS III TV-picture showing clear zone extending along the west African coastline from Cape Frio to Capetown.

with the position of the Gabon-Angola Front. The area of the Front was generally covered with broken cumulus clouds, but no pattern or discontinuity was discernible that could be related to the known position of the Front. During the cruise period, the Front was weakly developed and involved gradients that never actually constituted a frontal configuration. The strongest horizontal gradient of sea surface temperature for the 23° to 25° C. range (the range usually involved in the center of the frontal gradient) was 2° C. in 30 nautical miles. Sharper gradients were found around small nearshore patches of cool (less than 21° C.) upwelled water, but these had an apparent effect on cloud formation in only a few photographs--perhaps because of the small size of the upwelling areas.

CONCLUSIONS

This study has revealed that it is not feasible to monitor the position of the Gabon-Angola Front from satellite data during the September-December period, assuming that the oceanic and atmospheric conditions encountered on UNDAUNTED cruise 6802 were typical. Apparently the gradients involved in the Front during this period were too weak to produce an abrupt change in cloud cover.

A distinct pattern in the cloud cover was observed consistently off South-West Africa and South Africa, which is apparently related to cool sea surface temperatures from upwelling or advection of the Benguela Current. The large clear zone associated with the cloud pattern should provide a useful environment for air-sea interaction and satellite monitoring feasibility studies for the following reasons: (1) The presence of the clear zone is predictable. (2) Its boundaries are sharply delimited and probably reflect sharp sea surface temperature gradients. (3) It changes shape, mainly along the northern limit of the zone in a period of less than 24 hours. (4) Cumulus, stratus, and clear areas could be studied within a radius of about 50 miles in the vicinity of the northern boundary. (5) Frequently, a bifurcation appears in the northern boundary of the clear zone, probably reflecting advective patterns of surface waters. (6) The clear zone is associated with either a major upwelling area or a major surface current, or both.

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EXPERIMENTAL PRODUCTION OF FISH PROTEIN CONCENTRATE (FPC) FROM MEDITERRANEAN SARDINES

Norman L. Brown and Harry Miller Jr.

Early in 1967 the National Center for Fish Protein Concentrate (NCFPC) undertook to cooperate with the United Nations Industrial Development Organization (UNIDO)/FAO mission to the plant of the Société Nationale Farine Alimentaire Poisson (SONAFAP) at Agadir, Morocco. This plant had been set up some years before to manufacture FPC by solvent extraction of a press cake made by wet reduction of sardines. However, the plant had encountered production difficulties involving, among other problems, variability in the quality of the product. The quality was so low that its addition to foods was unacceptable. The objective of the FAO mission was to investigate the problems encountered by SONAFAP and to assist the plant in resuming production and distribution of FPC.

The first step was to determine whether a satisfactory FPC could be made from the available fish. NCFPC, at the request of UNIDO/FAO, prepared FPC from Mediterranean sardines shipped from Morocco, using the isopropyl alcohol (IPA) extraction process. This process had already produced stable products of reproducibly uniform quality with other fish. The Center's FPC program, having provided the technical information needed to obtain U.S. Food and Drug Administration approval of FPC as a food additive, had begun to broaden its investigations beyond the use of lean fish, such as red hake, to the much more abundant fatty fishes. Investigation of the use of Mediterranean sardines fitted well into the Bureau of Commercial Fisheries' program. The information developed in this investigation would assist the Moroccan project--and support Bureau efforts to broaden the base of raw materials permitted for FPC.

The use of other varieties of fatty fish will be the subject of a forthcoming publication.

NCFPC is continuing to cooperate with the UNIDO project by examining further samples of FPC produced in recent trials at the Agadir plant.

STUDY MATERIALS AND METHODS

Three shipments of Mediterranean sardines--one from Portugal, one from Yugoslavia, and one from Morocco--were received by NCFPC and processed into FPC. Although the species was not absolutely established when received, the point of origin of the fish identified reasonably well two shipments as Clupea pilchardus and one as Sardinia pilchardus. The fish, frozen immediately after capture, were flown to the laboratory at College Park, Maryland. Composition of the raw fish is given in Table 1.

Table 1 - Proximate Composition of Mediterranean Sardines (Percent by Weight)

Country of origin. . . . . Species	Portugal Sardine (Clupea pilchardus)	Yugoslavia Sardine (Clupea pilchardus)	Morocco Sardine (Sardinia pilchardus)
Date received	Dec. 1967	Dec. 1967	April 1968
Crude protein (N x 6.25)	16.7	16.8	19.1
Lipid	17.7	13.4	3.18
Ash	2.95	2.75	4.36
Volatiles (moisture). . .	63.7	68.6	73.3
Ca	0.68	0.61	0.35
P	0.57	0.51	0.28

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Note: Fig. 1, Tables 3 and 4 are in the appendix in reprint (Sep. No. 851) of this article. For a free copy of the Separate, write to Division of Publications, U.S. Department of the Interior, Fish and Wildlife Service, BCF, 1801 N. Moore St., Arlington, Va. 22209.

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Processing Details

In 1967, the laboratory procedure for making FPC from lean fish was a modified "crosscurrent" batch extraction consisting of the following steps:

1. A batch of fish was comminuted (ground to a hamburger-like consistency) and mixed with azeotropic isopropyl alcohol (AIPA) at room temperature, with a ratio of solvent to fish of 2:1 by weight.

2. After 30 minutes of agitation, the solids and liquid (miscella) were separated in a 12-inch basket centrifuge.

3. The wet solids were then re-slurried with fresh AIPA and extracted continuously for 2 hours at ca. 155° F. (70° C.) in a system where the extract (miscella) was continuously drawn off, filtered, evaporated, and the condensed overheads pumped back into the extractor. (All the nonvolatile solubles--proteins, lipids, etc.--remained in the evaporator and the condensed overheads became somewhat richer in water than the AIPA.)

4. The solids were then separated from the miscella in the 12-inch basket centrifuge.

5. The solids were desolventized (dried) in a vacuum oven (pressure ca. 2 inches of mercury, i.e., 50 mm) at 160° F. (71° C.) for 18-22 hours.

Since the sardines were expected to contain much more lipid than the lean fishes for which this procedure had been developed, the procedure had been modified (for sardines from Yugoslavia and Portugal) to include one or two additional hot extractions to determine the effect, if any, on residual lipid content. In the process outlined above, this was done by repeating stages 3 and 4 once (Procedure A) or twice (Procedure B).

By the time the Moroccan sardines were received (April 1968), the laboratory had shifted its extraction procedure to a countercurrent system (Procedure C) so that processing information obtained would be directly applicable to larger-scale systems likely to be used for industrial production. Consequently, the sardines received from Morocco were processed in a manner closely approximating a commercial batch countercurrent process, using a 4-stage countercurrent procedure with an overall ratio of solvent to fish of 2:1. (This represents between one-third to one-fifth the total solvent used in Procedures A and B.) This procedure is outlined schematically in Figure 1 (in appendix). The first stage was performed at room temperature (with no added heat), the second, third, and fourth stages at about 155° F. (70° C.). The solid liquid slurry from each stage was separated, as in step 4 of the procedure outlined above. The final solids were desolventized as in step 5.

Theoretically, the processing of a large number of batches of fish would be required before this countercurrent system would attain steady-state operating conditions--that is, before the compositions of the miscellae and solids in each stage do not change from batch to batch. However, detailed analysis of the composition of the materials in each stage shows that, as a practical matter, the system essentially will have reached steady-state conditions after the fourth batch, and definitely after the fifth stage. Only the FPC produced by countercurrent extraction of Moroccan sardines (Sardinia pilchardus) was subjected to the complete processing procedure now used for FPC produced in this laboratory. Furthermore, because the fifth batch was most likely to represent steady-state conditions, fluorine analysis and nutritive evaluation were performed only on this batch of FPC.

Results

The results obtained with the three shipments of fish received are listed in Tables 2, 3, and 4. (Tables 3 and 4 are in appendix.) The proximate composition and amino acid pattern obtained for a sample of FPC made at Agadir in 1966 also are shown. In addition, average values are listed for proximate analyses, PERs, and a typical amino acid pattern for FPC made from hake by standard crosscurrent batch extraction process using AIPA. This process (Procedure "D") consists of a four-stage AIPA extraction using 2 parts of fresh IPA to one part of fish at each stage. Solid-liquid separation is accomplished in a 6-inch continuous solid bowl centrifuge and desolventization (drying) is performed in a 6-cubic-foot, double cone, tumbling vacuum dryer.

DISCUSSION

It is apparent from the data in the tables that no basic problem exists in processing sardines into FPC by the IPA extraction

Table 2 - Chemical Composition of FPC Produced from Mediterranean Sardines and Red Hake

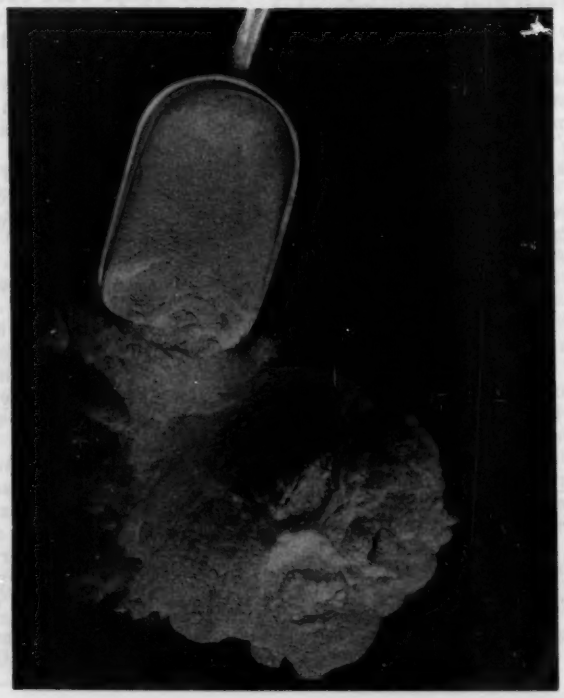
Country of Origin Species	PORTUGAL Sardine (Clupea pilchardus)		YUGOSLAVIA Sardine (Clupea pilchardus)		MOROCCO Sardine (Sardinia pilchardus)							U.S. Red Hake (Urophycis chuss)	
Sample (FPC)	Sp-1	Sp-2	Sy-1	Sy-2	Sm-1[a]	Sm-2[a]	Sm-3[a]	Sm-4[a]	Sm-5[a] (b)	Sm-5[a] (c)	SONAFAP FPC (Lot 39)	BCF FPC Typical Values	
Extraction procedure (h)	A	A	B	B	C	C	C	C	C	C	?	D	D
Date processed	1-3-68	1-4-68	1-9-68	1-10-68	7-23-68	7-24-68	7-25-68	7-26-68	7-29-68	7-29-68	8-9-68	(f)	(g)
Proximate composition (percent by weight)													
Crude protein (N x 6.25)	81.2	82.0	83.3	84.5	77.0	79.6	78.8	80.8	79.7	77.7	85.3	85.0	89.2
Lipid	0.70	0.90	0.56	0.23	0.5	0.15	0.24	0.23	0.22	-(e)	0.79	0.15	0.16
Ash	14.1	14.3	13.6	13.3	17.3	16.6	17.3	16.3	17.0	17.4	12.50	10.97	11.55
Volatiles (moisture)	4.8	3.8	3.6	3.7	7.0	4.8	5.5	4.6	4.4	8.2	4.0	4.50	0
Ca	3.5	3.8	3.9	3.8	4.9	4.7	4.8	4.5	4.8	-(d)	3.8	2.95	3.10
P	2.4	2.4	2.4	2.2	3.0	2.9	3.0	2.5	2.9	-(d)	2.3	1.79	1.88
F (ppm)	-(d)	-(d)	-(d)	-(d)	-(d)	-(d)	-(d)	-(d)	-(d)	70.2	-(d)	-(d)	-(d)
IPA (ppm)	-(d)	-(d)	-(d)	-(d)	120(e)	311(e)	124(e)	200(e)	-(e)	103	-(d)		

(a) These samples are the results of each batch of the five-batch countercurrent extraction.
(b) Before steam-stripping to reduce the residual IPA content.
(c) After steam-stripping to reduce the residual IPA content.
(d) This analysis not performed on this sample.
(e) This analysis was performed after the sample was steam-stripped. All other analyses on this sample were performed before steam-stripping.
(f) Average values for 10 samples, calculated on "as is" basis.
(g) Average values for 10 samples individually calculated on dry weight basis.
(h) See text for explanation of procedure.

process although considerable engineering modifications of the lean fish process may be needed. The only significant distinguishing factor among the three batches of sardines processed is the relatively high residual lipid content of the FPC made from the Portuguese and Yugoslav sardines. It was unfortunate, for the purposes of comparison, that these fish initially contained much more oil than the Moroccan sardines (perhaps a result of seasonal variation) and were not extracted in a countercurrent system as were the latter. However, previous work in this laboratory on the countercurrent extraction of fish with initial lipid contents as high as 20 percent has shown the residual lipid of the resultant FPC to range from 0.10 to 0.29 percent. This experience leaves little doubt that these sardines would have yielded an FPC with residual lipid contents of the same order if they had been extracted by the same procedure. The nutritive values of both SONAFAP FPC and Sample Sm-5 are comparable to FPC made from red hake, and all are at least equal to that of casein. The fluoride content of Sm-5 is well below the 100 ppm. now required by the U.S. Food and Drug Administration.

SUMMARY

NCFPC's investigation on production of fish protein concentrate (FPC) by isopropyl alcohol extraction of Mediterranean sardines indicates that the products meet all present U.S. Food and Drug Administration requirements on chemical composition and nutritive value. The products were made both by laboratory procedures involving combinations of cross-current and continuous batch extraction, and by countercurrent extraction procedures that approximate commercial production methods. It is particularly significant that, in agreement with results obtained for FPC made from other species of fatty fish in this laboratory, a satisfactory FPC can be produced from Mediterranean sardines by this prototype commercial process.



FISHERY OCEANOGRAPHY--III

Ocean Temperature and Distribution of Pacific Salmon

Felix Favorite

The research on the distribution and migration of the European eel, Anguilla anguilla, in the North Atlantic Ocean in the early part of this century became a classic study of fish and the ocean environment, many aspects of which remain unsolved today. The movement of this species during its life cycle is practically opposite that of the Pacific salmon, genus Oncorhynchus. Adult male and female eels migrate down rivers of western Europe and northern Africa into the ocean, where they spawn in the deep layers of the Sargasso Sea (in the southwestern North Atlantic Ocean, several thousand kilometers from the streams) and then die. The eggs hatch into larvae, which are passively transported for 2 years by ocean currents toward the European coast. Here the transparent larvae metamorphose into small, black eels that swim up the fresh-water streams to grow and mature into adults; the cycle is than repeated.

The Pacific salmon enter fresh-water streams along the coast of the northern North Pacific Ocean as adults; they spawn and die in the shallow streams. When the eggs hatch, the young salmon move downstream into the ocean, where some stocks are known to migrate long distances, yet return to their natal streams to repeat the cycle. The contrast between the salmon and the eel is rather amazing, and the opportunity to study the relations between the ocean environment and the Pacific salmon has presented a stimulating challenge.

The Pacific Salmon

Less than 30 years ago, the movements of Pacific salmon during the marine phase of their life cycle were relatively unknown. Less than 20 years ago, it was believed that pink salmon, O. gorbuscha, off the coast of southeastern Alaska rose from deep water to begin a shoreward migration; no evidence was found that they had come from the open sea when first noticed in coastal waters. At that time, the Japanese believed that the marine phase of their life cycle was spent in an unknown area of the North Pacific Ocean.

Even though no oceanic fishing for salmon was conducted, early estimates of an acceptable ocean environment were: depth, 0 to 200 m.; salinity, 30 to 35 ‰; and temperature, 0 to 20° C. The temperature range was probably based on summer stream and coastal temperatures, although evidence existed that adult salmon had migrated through streams where temperatures reached 27° C. Nevertheless, if no other factors were involved, a tolerance to surface temperatures of 20° C. would permit salmon to migrate as far south as lat. 30° N. across the entire ocean.

Studies of salmon on the high seas by the BCF Seattle Biological Laboratory began in 1955. Those were exciting times. Not since the studies of Charles H. Gilbert and his associates, conducted half a century ago off Alaska, was so much being discovered about the ocean distribution of Pacific salmon. Each day, during each set, the capture of additional salmon appeared critical, and little time could be spared for environmental research that competed with the fishing program. Nonetheless, some environmental observations were made aboard the charter fishing vessels.

Environmental Observations

For reasons to be explained fully later in this series, observations of temperature and salinity were made to depths of 1,000 m. at fishing stations to provide some indication of current patterns in this relatively little-known region of the North Pacific Ocean. These observations, made at night after the gill nets were set, posed little hindrance to the fishing program except for 1 or 2 hours of extra work for one or more of the crew. Only after several years of field work did we have instruments to make observations while

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the relatively slow (8- to 10-knot) vessels were en route to the next fishing location along predetermined cruise tracks.

We have observed that salmon are not found at 1,000 m. Why then did we require data at such depths, and were they really necessary? The lack of interest in environmental observations at depth during these early investigations had some basis in fact. It was known from the fishing efforts of the Japanese, as well as our own, that most salmon were caught in the upper half of a usually shallow 6-m. (20') gill net at night. This knowledge reinforced the belief that salmon basically were a surface fish, and that their distribution depended more or less upon surface conditions.

In fact, one early hypothesis concerning ocean distribution of salmon was that the extremely low surface temperatures--less than 0° C. in western North Pacific Ocean and northern Bering Sea during winter (due to ice formation in coastal areas and its subsequent advection eastward)--probably caused southward and eastward movement of salmon. This hypothesis implied that during winter the entire oceanic salmon population would be south and east of the Aleutian Islands, probably concentrated in the Gulf of Alaska. Winter fishing in the early 1960's, by BCF Seattle Biological Laboratory, however, showed that salmon were present as far west as long. 170° E., and even in the north-central Bering Sea.

An explanation is possible concerning the position of salmon caught in gill nets that neither has been proved nor disproved: When salmon close to the surface approach the net, it is detected sonically. A natural avoidance reaction would be for the fish to swim upward toward the surface and, unless they jump out of the water (which is unlikely), they are caught in the upper portion of the net. If they swim downward, no air-water interface restricts their movements, and they are able to pass under the nets. (In studies with sunken gillnets, some salmon have been caught at depths in excess of 30 m., or about 100 ft.)

Surface Temperature & Salmon Distribution

Evidence obtained during late spring and summer in the mid-1950's indicated that surface temperatures were not as directly related to salmon distribution as subsurface temperatures. The southern limit of salmon in the central North Pacific Ocean (as determined by gill-net catches) was at about lat. 47° N. A sharp faunal division seemed to occur here; south of this latitude, only albacore (Thunnus alalunga) were caught (salmon and albacore were taken in same net at only one of hundreds of fishing locations). The surface temperature at this latitude during the fishing period was about 11° C.; we tended to consider this temperature as an upper threshold for salmon in the ocean. Salmon, however, were caught in water temperatures of 12° to 13° C.--at some locations temperatures were much lower than the earlier estimate of 20° C. If surface temperatures of 13° C. are not limiting, salmon should be found south of lat. 40° N. in midocean, but they have not been taken there. Although it is possible that the southern limit of salmon is dictated by the northward limit of the carnivorous albacore, this relationship has not been proved.

The investigations suggested, as long ago as 1956, that temperature distributions at depth were closely related to the distribution of salmon. The subject still has not been studied. Cold winter air at these latitudes cools the sea surface and causes the water to be more dense than that below; because of this change in density, some masses of water sink and others well up until the upper part of the water column has a uniform temperature, representative of minimum air temperatures.

Subsequent insolation (exposure to sun's rays) during spring and early summer warms the surface layer. As warm water is less dense than cold, no sinking occurs other than that due to turbulent mixing. A lens of warm water forms at the surface. Before diffusion can distribute this heat to sufficient depths and eradicate the lower temperatures formed during winter, fall cooling begins. Thus a temperature-minimum stratum is formed (temperatures below the depth of winter mixing are higher than those causing the winter turnover); this structure is a relatively permanent feature of the northern North Pacific Ocean.

Temperature-Minimum Stratum

Several important points are illustrated by the gill-net catches and temperatures along long. 155° W. during summer 1956 (fig. 1). It is obvious that the two largest catches (94 and 150 salmon) were made at the more northerly

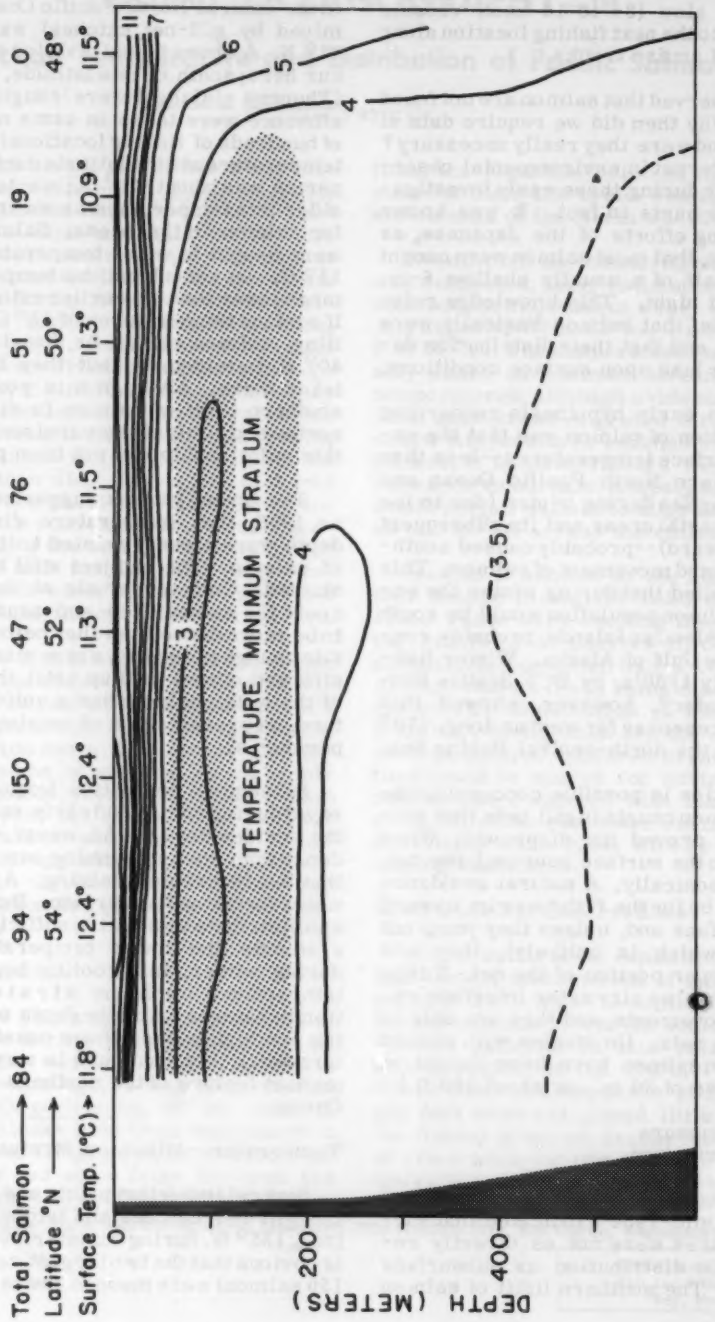


Fig. 1 - Vertical temperature distribution and surface gill-net catches along long. 155° W., summer 1956. Temperature minimum stratum shown by shading.

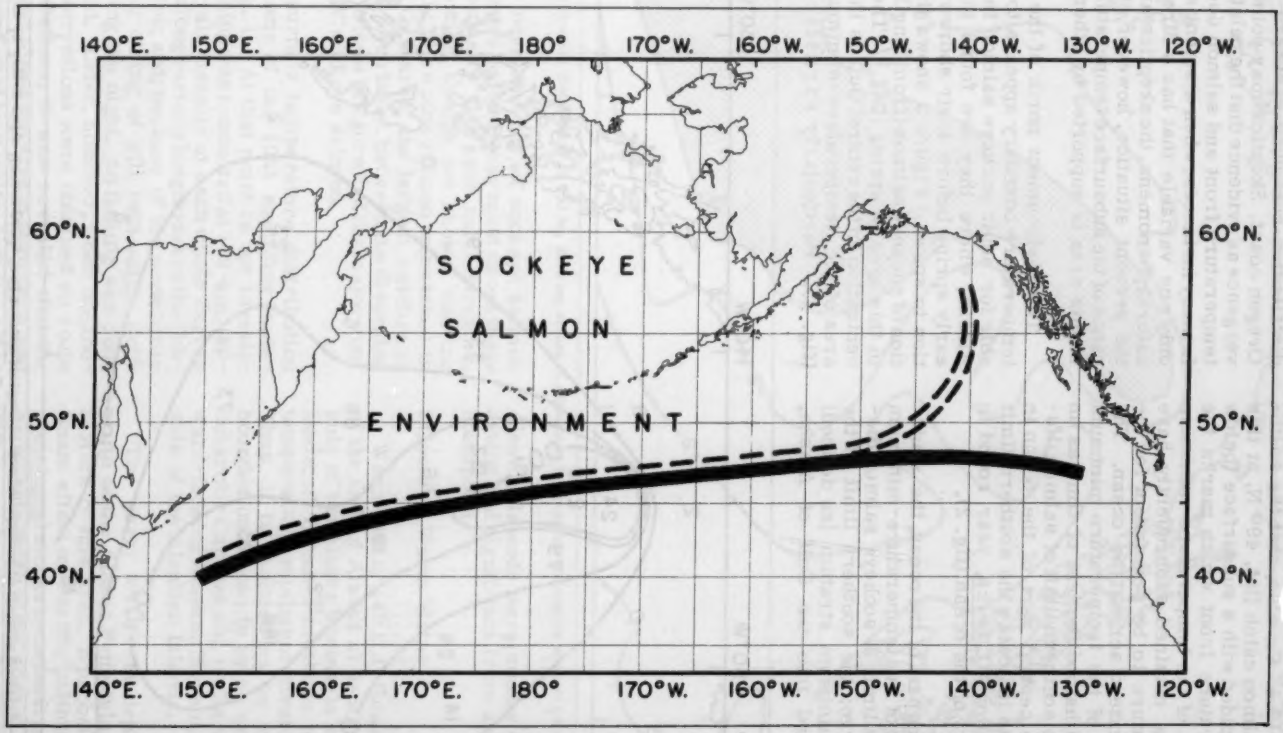


Fig. 2 - Approximate positions of southern boundary of temperature-minimum stratum of 4.0° C. (shown by dashed bar), and the southern boundary of sockeye salmon distribution as determined by gill-net catches (shown by solid bar).

stations and in water of maximum surface temperature--12.4° C.; also, that the southern limit of salmon catch (lat. 49° N. at this longitude) coincided with a subsurface (below 50 m.) temperature front which marks the southern limit of the temperature-minimum stratum. Data obtained subsequently have shown this feature to be permanent for the region and to extend across the ocean. The southern limit of the temperature minimum stratum has withstood the test of time as an indicator of the southern limit of salmon distribution in the central part of the ocean in summer; it also indicates the southern limit of sockeye salmon, O. nerka, year round in the central part of the ocean (fig. 2).

In the eastern part of the ocean, the southern boundaries of the temperature-minimum stratum and the limit of sockeye salmon distribution diverge; the southern limit of the temperature-minimum stratum (as defined) turns northward into the Gulf of Alaska, whereas the southern limit of sockeye salmon distribution continues eastward toward the Oregon coast. Skeptics may point to this divergence as evidence that the relation between temperature front and salmon does not hold. In many instances, when a scientist measures only one variable that has a direct effect on natural phenomena, the skeptics are right. In the present situation, however, the significance of the subsurface temperature boundary in this area is supported by other data.

The environment north of the subsurface temperature boundary appears to be preferable for adult sockeye salmon in the Gulf of Alaska, where they are found in winter and early spring before their shoreward migration to spawn. Figure 3 shows the distribution of sockeye salmon (from longline catches) in this area in spring 1962.[1/] The large concentration in the central Gulf is in the general area of the temperature-minimum stratum (fig. 4). Particularly significant is the

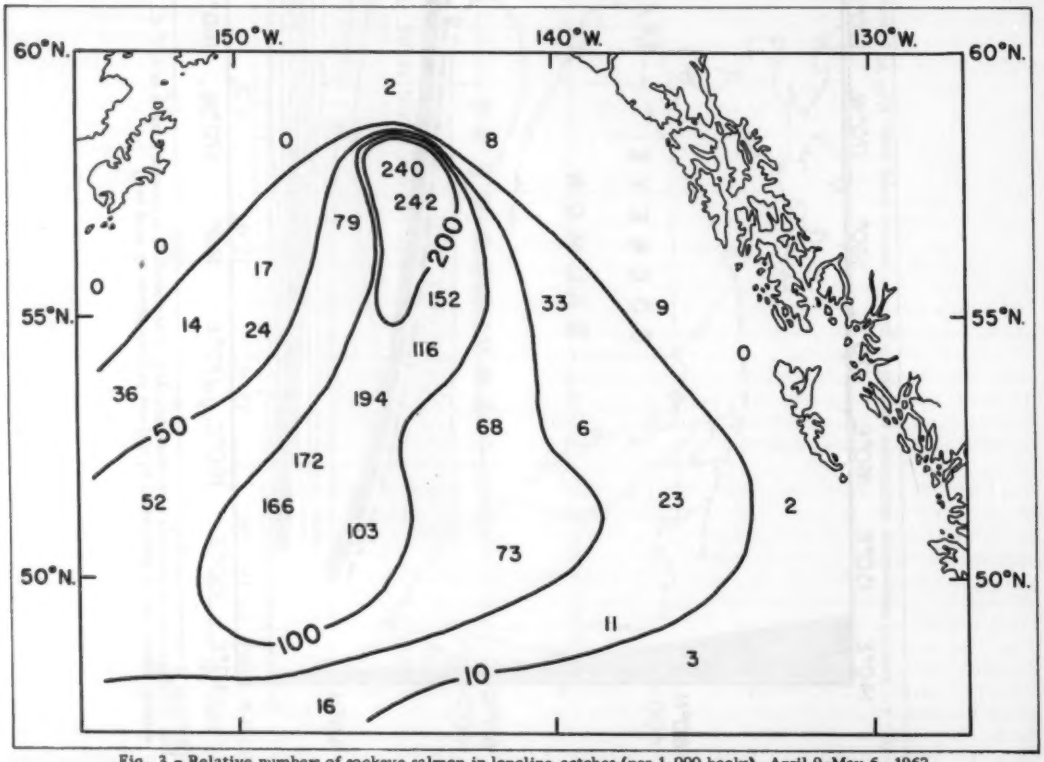


Fig. 3 - Relative numbers of sockeye salmon in longline catches (per 1,000 hooks), April 9-May 6, 1962.

1/Fisheries Research Board of Canada. 1964. Progress in 1962 in Canadian research on problems raised by the Protcol. Int. N. Pac. Fish. Comm., Annu. Rep. 1962: 30-53.

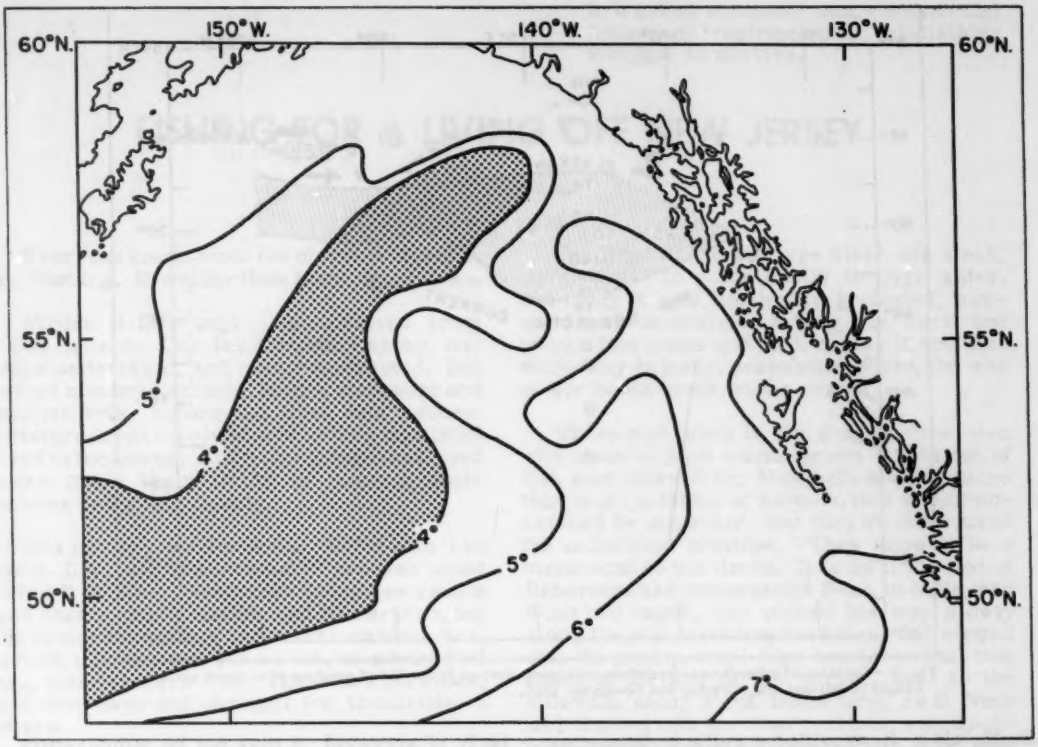


Fig. 4 - Temperature distribution at 150 m. showing extent of subsurface temperature-minimum stratum (shaded), spring 1962.

absence, or near absence, of sockeye salmon in coastal areas because they must cross these waters eventually to reach natal streams. Also interesting, though not shown, was the fact that only a few pink salmon were taken in the central Gulf area; the largest catches of pink salmon were taken between the diverging boundaries shown in figure 2 of the major concentration of sockeye salmon.

The subsurface temperature distribution indicates some of our 1965 sampling inadequacies (fig. 1). At that point in our investigations, fishing was conducted at 110-km. (60-mile) intervals, usually at each whole degree of latitude along various longitudes in the Subarctic Region; and, because of the possibility that the long string of gill nets might drift ashore during the night, no fishing was done close to land. Later, however, when oceanographic observations were obtained en route to fishing stations, it was revealed that the inshore areas along the Alaska Peninsula and Aleutian Islands were among the most interesting and significant from an environmental standpoint.

Effects of Warm Water

Warm water (4° C.) flows westward out of the Gulf of Alaska at depth along the south side of the Alaska Peninsula and Aleutian Islands; it forms a northern boundary to the temperature-minimum stratum in the Gulf. Thus, it is isolated as an offshore feature bounded on the south by an eastward-flowing Subarctic Current and, on the north, by a westward-flowing Alaskan Stream, along the south side of the Aleutian Islands.

The warm water at depth immediately south of the Alaska Peninsula is a permanent feature of this area. It probably has a significant effect on Pacific halibut (Hippoglossus stenolepis) stocks because it occurs at the approximate depth of the edge of the Continental

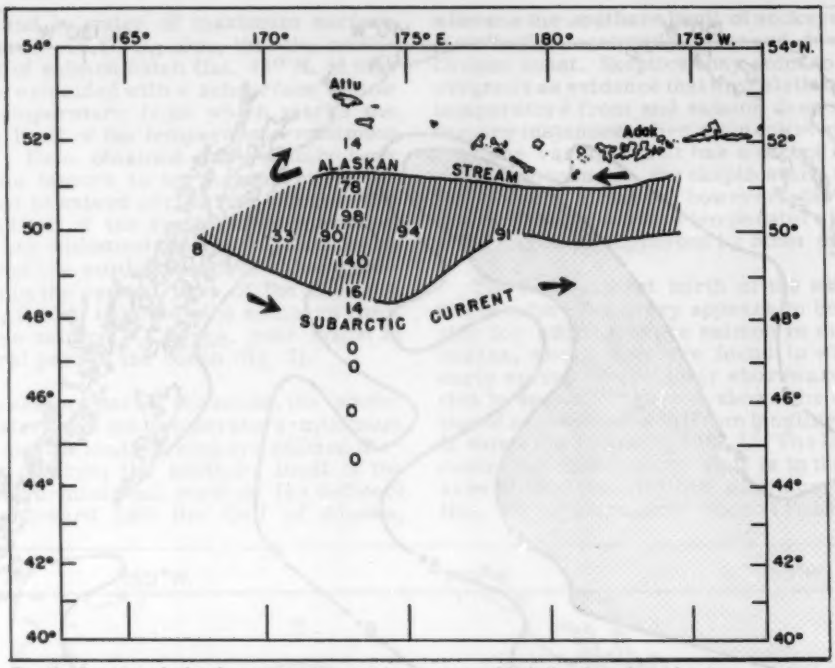


Fig. 5 - Location of subsurface temperature-minimum stratum (shaded) and numbers of sockeye salmon caught in gill-net sets, October and November 1965.

Shelf; also, it provides a uniform temperature of 4 to 5° C. during the year at 100 m., where surface temperature may vary from 2 to 12° C., and inshore bottom temperatures may vary almost as much as surface temperatures.

The location of the temperature-minimum stratum also appears to influence the distribution of maturing sockeye salmon south of the Aleutian Islands in fall. Data obtained in October and November 1965 show that large numbers were caught in surface gill nets in the general area of this stratum (fig. 5).

I have been careful not to imply a cause-and-effect relationship. Although the subsurface temperature distribution is a guide to determining salmon distribution (particularly of sockeye), it may not be temperature alone that is the controlling factor. It is obvious that ocean currents are involved; these currents will be discussed in a later article. The fact that the temperature-minimum stratum occurs at such a shallow depth is because the subsurface salinity distribution effectively prevents the cold surface waters from sinking any further. Both temperature and salinity determine density, which in turn governs flow. Furthermore, this plateau-like feature has cold water (approximately 3.0° C.) normally found only below 600 m. south of about lat. 48° N. in eastern part of ocean. It exists year round at depths usually less than 100 m. and has interesting biological and chemical aspects that have received only limited attention. Much research remains to be done.

In a harsh economic sea, commercial fishermen--aging, hardy, fatalistic--struggle to survive.

FISHING FOR A LIVING OFF NEW JERSEY

Nicholas Kazan

Everyone knows what the oldest profession is. Fishing. It is older than man. Or woman.

Figure it this way. Man evolved from lower orders: One day a monkey spoke, another understood, and man was created. But before monkeys existed, before dinosaurs and pterodactyls, before the first venturesome creature crept onto land, everything that lived lived in the ocean. And most things that lived there made their living by opening their mouths and going fishing.

It's not so easy for man. Before he can taste fish, an anachronistic process must bring it to him. Fishermen today use radios and charts, depth meters and fish scopes, but the basic elements of their art remain: a sea, a man, a boat, a net (or a hook, or a harpoon) and, somewhere, a fish. These are the rules, and they have not changed for thousands of years.

Men who live and work by these rules are scattered on a 50-mile radius from Philadelphia--in inlets, bays, and harbors along the southern New Jersey coast. Half a mile from the beaches and the Ferris wheels and the Spin-Inn Drive-In Hamburger joints are secreted half a dozen dock areas that send fresh fish to Philadelphia, Baltimore and New York.

Some docks are old and healthy, others old and dying, but the state of the industry is best described by the scene at one of them: Oteen's Harbor in Wildwood.

There, behind the 30-odd boats that were built to trawl for fish and now dredge for clams because that's what's left, behind the dock that has rotted under foot and collapsed overhead, looms the huge rusted hull of a ship--a fishing boat that was begun and never finished.

The lines of the boat are clean and sleek, and promise to guide easily through water. But today it sits helplessly grounded, awkward and anomalous among the cars and trucks that come and park beside it and then shift away in jerky, graceless spurts, the way motor boats move on the ocean.

Those that work in its shadow--the men who clam or pack clams or cut fillets out of fish sent down from Massachusetts--ignore this most pristine of vessels, this wreck untouched by seawater. But they all understand its unfulfilled promise. They know it is a monument to the times. It is as if the God of fishermen had commanded Noah to build, and Noah had begun, and picked his way slowly along the pier, avoiding the holes, and hopped into the pretty, vinyl-blue tourist vessel that floats at the end of the harbor, next to the sidewalk along Park Boulevard; as if Noah had chatted with the other tourists, eaten popcorn and hot dogs and sipped gin, and then gone out for a spin on the waters.

Fishing is a dilapidated, retarded industry in New Jersey, and it needs a flood. If the vast cleansing waters do not descend, if there is no new world created, the present industry will splinter and rot until nothing remains--not docks, boats, fish or fishermen.

The decline in available fish has been appalling. John Shaw, a lobster pot fisherman from Atlantic City, recalls that in the old days "the problem wasn't catching fish; it was selling them. We caught too many." Today the situation is reversed. All edible fish are sold, and rising prices help to compensate for diminished fish stocks. But the time may come, regardless of price, when there is nothing left to sell.

Last year New Jersey fishermen landed 126 million pounds of fish, slightly more than

Mr. Kazan is a free-lance writer. Article appeared in 'Today,' Sunday Magazine of 'Philadelphia Inquirer,' Aug. 17, 1969.

their fathers and grandfathers caught in 1901. But last year more than half the fish landed were inedible--caught for industrial use. The 1901 catch, made with the most rudimentary equipment, included at least 12 million more pounds of edible fish than the 1968 catch.

So it goes. The New Jersey fishery reached its peak level, 540 million pounds, in 1956. But almost 90 percent of that catch was menhaden, a fish caught for processing into such products as animal feed, lipstick and linoleum. By 1956, most edible fish were becoming scarce.

That trend has become precipitous in the past seven years, following the heavy storm of 1962. Since then virtually every species of finfish, including menhaden, has declined drastically. Porgy and fluke (a kind of flounder), which have been the mainstays of the local industry for the past decade, are being caught at less than a third of their former levels. Only higher prices and an increase in available shellfish--lobsters, surf clams and scallops--have allowed the industry to survive.

Fishermen regard the depletion of the seas with alternating moods of indignation ("Why doesn't the government help? It pays the farmers not to plant, but it doesn't pay us not to fish.") and equanimity ("It's a fading life like anything else.") Fishermen accept whatever fish come into their nets, whatever money comes to their pockets. The sea, the work, is always there, beckoning; and it's like a boxer missing his opponent, it's just as much work to catch nothing. Besides, as one dock owner says, "Many fishermen think like I do. Fishing may be dead here in 20 years--but so will I."

As docks are old, as boats are old (more afloat today were built before 1925 than since 1960) so are the fishermen. They look like the backbone of the Social Security system, these old men of the sea, and they walk on land with the easy rocking rhythm of the water. They will haul in a net on the day they die; and those that won't, the ones who come ashore first, do not retire to their homes and wives; you see them packing fish on the dock or running the pulley that unloads the catch. When they get too old for that, they stand and watch. They say it gets in your blood.

Most have had it in their blood all their lives. They started fishing because they went to sea in the Navy and liked it, or because they lived in the neighborhood and watched, or because their fathers handed them a mop and said to swab the deck.

They've fished ever since. It shows in the clear blue eyes, the skin thick and wrinkled like a turtle's, the testy sinuous strength that gives a man of 60 the vigor of someone 30 years younger.

It shows too in their language, which is rough, and in their use of it, which is simple and direct. A fish can't be sweet-talked or hustled. You can swear at him if you want to make yourself feel better, but there's no use lying or prevaricating. The only truth a fish understands is your net.

The truths of fish and net are primitive ones without a visible financial future. They have nothing to do with tax benefits or stock transfers, with health insurance or early retirement plans. It is not hard to see why most "younger" fishermen turn out to be 40, and why young men who used to go to sea, today go to college. A few still move from the Navy to the fishing boats, but there is a shortage of men on the docks, and sometimes a captain has to wait a week to gather a crew. The eager boys from the neighborhood are gone, and today when a captain takes his son on board, he hopes the boy will get seasick--and sea-weary. Only in small towns like Wildwood does the old familiar pattern hold true. There you can still see a 12-year-old boy scrubbing the deck after the boats come in. You ask him about the day's catch and he frowns: "I don't know. Ask my father; he's the captain."

But even most old-timers say they wouldn't go into the business today. And then they glance toward the water, shrug, and smile--as if to say that it's not a business, it's a way of life, and they're glad they had the chance to live it.

As much as the financial prospects, that way of life may discourage younger men. Sig Hansen, a big ruddy Norwegian who worked at sea for 52 years and now manages a fishing cooperative at Point Pleasant, says: "Some young men still come and say they want to go fishing, but one trip out and you don't see them any more. They get seasick. Besides, the younger generation wants to sleep."

A fisherman does his sleeping on shore. As soon as his boat leaves land, he tows his net 24 hours a day as long as he's out there--three to ten days. At night he tries to sneak three or four hours sleep while one of the nets is in the water--and while the rest of the crew checks the last tow for "trash," fish that can't be sold and have to be thrown back.

Of course not all fishermen go out for a week at a time. Most clam dredgers work on "day boats" that come in every night, but they stay out for 13 hours--from four in the morning until five in the afternoon.

Nobody says the life is easy. They say it's strenuous. They say it's hazardous, too, both physically and financially. Every time out you run the risk of being rammed at night by a larger vessel, or being caught in rough seas that may throw a man overboard or sink a boat. Seven boats from southern New Jersey were lost in the 1962 storm.

As if these worries weren't enough, you never know when you may snag your net and wire and lose both (value--$1000). Or when your technical equipment may break down and send you home early. Or when you'll have a "broker," a trip that doesn't pay for supplies. And when you come home with a boat full of fish, sure of your fortune, you may find that the price has dropped from 30 cents a pound to 10.

For all the uncertainty, fishermen still make what they call, simply, "a living." In a very good year a captain can clear around $18,000, and a member of his crew about half that. But the rewards, the fishermen say, are largely intangible--the beauty of the sea in the summer, three months out of 12; the sense that each trip is a mystery, a bout with fortune; and the firm self-respect that comes from working for yourself (every crew member gets a percentage) and yet being part of a crew.

Fishermen are among the last of the hardy, independent Americans--the last frontiersmen. The captain of a boat in Atlantic City explains: "You take a guy on my crew and put him behind a desk, and nine times out of ten he'll get fired. When he's out there he doesn't have to punch a clock, to get here at nine and leave there at five. He's working for himself. He's more his own boss. Of course, the skipper makes the decisions, but he consults the crew. And everybody on board knows that the better the gear is, the more fish he'll catch and the more money he'll make."

The interdependence of a fishing crew acts as a powerful communal force. It molds the men into a unit that has much of the cohesion and the spirit of a Navy boot camp or a high school locker room. The men rag each other with the same raucous enthusiasm:

"Look sharp? You couldn't look sharp if you had your face lifted. I feel good because as long as you're alive I know I'm not the ugliest guy in the world."

And out on the water the communal feeling increases; it extends beyond the limits of any single boat. Fishermen lend each other equipment, assistance, and advice on where to fish. If you need something, it's a long way--often a hundred miles--back to shore.

This spirit even encompasses the foreign boats that have moved into our coastal waters during the past ten years. Much has been written about resentment toward these boats, especially toward the most numerous ones, the Russian trawlers. But the fishermen themselves--American or Soviet--are more likely to wave than to curse at each other. Our fishermen say, "They're trying to make a living just like we are. They're catching fish to feed people."

At times the Russian boats also have been blamed for the decline in available fish, so much so that an agreement recently was reached which prevents Soviet vessels from fishing for the most valuable edible finfish.

But the Soviets made the agreement because they weren't interested in these fish. They knew that such species were on the decline, and they brought their large vessels here to fish for plentiful varieties, like herring and hake, that can't be sold in this country. Russian boats may be retarding the recovery of the best species, but they are not responsible for the present depletion.

Probably no single factor is responsible, but every man in the business looks for a primary cause. This is the ten-million-dollar question--the industry's present value; and every man comes up with his own answer. Vernon Rise, manager of a menhaden plant in Wildwood, said, "The decline started in 1963, right after the big storm. I still say

that had something to do with it. The storm changed the bottom out there."

Sig Hansen, Point Pleasant fisherman: "I lay it to overfishing. We've been doing it for 20 years. The Russians will leave soon. You can bet they won't come 4000 miles for nothing."

Warren Lund, former fisherman, now a Cape May dock owner: "Fishing's not dying out. It's changing like any other small business. Fish protect themselves. When they start getting caught, they move. The porgies and the fluke are leaving, so we'll have to create a demand for something else. Like mackerel. We have more mackerel now than I've ever seen."

Alfred Jones, Atlantic City dock owner: "We're killing all the young. The government should pass laws requiring a certain mesh size on the nets and prohibiting sale of anything smaller. What would happen to human population if we destroyed all the young males?"

"Captain Jack" Lawson, itinerant fisherman: "You used to be able to get croakers all day long--now they're down off Mississippi. We're catching scallops here that used to be off Nantucket, and they're getting Boston mackerel in the Chesapeake Bay. Either the water's getting colder or the equator's moved."

The government laboratory in Woods Hole, Mass., reports that ocean temperatures have been dropping for 15 years, but they say the trend may have stopped. The cooler waters here account for the increase in available shellfish.

If New Jersey alone were registering declines, some local cause (foreign boats, the storm, colder waters) might be held accountable. But decreasing fish stocks is a national problem. The United States now supplies less than a fourth of the fish she consumes. Once second in the world in total poundage, she is now sixth.

So as our primary cause we must look for a national problem, and the one explanation most often cited by fishermen is that ubiquitous and invisible destroyer, pollution--industrial, detergent, human, and agricultural (pesticide) pollution.

Captain Dave Hart, who had his own commercial boat for 18 years and now works for various government agencies, documents a persuasive case against pollution: "The species that don't use the inland estuaries for spawning--herring, hake, whiting--all seem to be in good shape. The porgies, the fluke, the sea bass, all the ones that use the estuaries, are declining. Of course there has to be an exception: Striped bass spawn in the estuaries and they're more abundant than ever. But the overwhelming patterns points to some sort of pollution."

A possible solution to this problem comes from Harry McGarrigel, dean of the Atlantic City dock. ("Me and my father before me. We've been on the street since 1911.") Harry is a heavy, friendly man. As he sorts fish on his dock he looks like the owner of a New York delicatessen, but his friends note with pride that he went to Washington to help negotiate the treaty with the Russians. Harry McGarrigel says, "All we need is $35 million dollars to pipe all that waste out to sea and then things will be straightened out, after about ten years. It'll take that long for the water to clear up."

However long it would take for the waters to clear--and ten years probably is an extreme prognosis--the fishermen need someone to begin the process. That someone probably will have to be the Federal Government. States take little interest in fishing--they don't even collect statistics, and what interest they do take varies. New Jersey has a law, poorly enforced, prohibiting sale of small fish; most Southern States have no such statute.

Compared to other nations, even our Federal Government pays negligible attention to its fishery. Foreign countries build and man enormous fleets complete with the most modern equipment; our country authorizes Small Business loans. Besides the loans, the U.S. Bureau of Commercial Fisheries confines its activities to periodical bulletins on fish sightings and prices, and to research. Thus far the predominant product of the research has been expensive new equipment that small fishing boats cannot afford. But recently the government has been developing a new product that may help revitalize the industry.

Fish Protein Concentrate (FPC) is an odorless, tasteless fish flour made by

reducing six pounds of whole fish into a pound of fine powder. Because FPC converts the whole fish, it retains every one of the 30-odd amino acids that are the main components of protein. The result is a product that is 75 percent protein--and that could do much toward relieving under-nourishment throughout the world.

Other countries, like Norway and Sweden, already have begun to produce FPC. The United States is now building its first plant. Although the Food and Drug Administration has approved only hake-like species for the pilot project, all signs indicate that it will soon approve all species.

If so, this would mean that the great mass of trash (sea robins, dogfish, sharks) as well as the abundant species the Russians are catching (herring, hake, mackerel) could be harvested. The boats that would go for such fish would have to be enormous company vessels, too large to be owned by the captain, too expensive and mechanized to hunt for fish in the old, romantic and desultory fashion. The men who worked these boats would live something like today's clammers or menhaden fishermen. Their work would be more routine, more like drudgery and less like sport, than the life of today's finfishermen. The sea is full of trash.

But there is a possibility that the small boats may linger on. Captain Dave Hart from Cape May explains, "Up to now we've done our damnedest to destroy the natural ecology of the sea. We've taken the good fish and let the weeds flourish. If we start to fish for trash we may restore the natural balance."

He goes on to describe what may happen then: "If the finfish do come back, they may do so very suddenly. Fish can reproduce like insects. Scientists opened up one striped bass and found three million eggs."

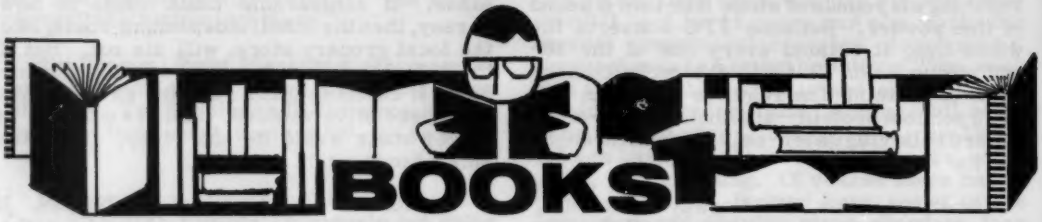
If the finfish return in vast numbers, large vessels probably will be constructed to fish for them. Such boats already operate out of enormous fishing ports like New Bedford, Mass. If comparable boats come to New Jersey, then the small independent boats, like the local grocery store, will die out. But if the valuable finfish increase in limited numbers, if catching them remains an uncertain and speculative venture, construction of larger boats would be too risky. Then the small boats might survive.

No one can be certain what will happen. It seems that fishing's future is largely in the hands of the Federal Government. If it demonstrates that FPC is a feasible product, it may help create a new industry. But the real problem probably is the estuaries. The government must weigh America's traditional agricultural-industrial perspective--the one that ultimately leads to contaminated estuaries--against a future in which man may have to depend on his marine resources for food.

But the sea is a mystery. Next year, the year after, the fish may return. They've done it before. "Captain Jack" Lawson says," Anyone who thinks he knows anything about the sea is a damn fool." The fishermen have a saying to express this. Ask one of them anything about fish and he'll answer, as often as not, with a shrug--and then he'll add: "They have tails, and they swim."

But every fisherman changes the expression a little to suit his personality. "Captain Jack" is 67 years old, a lithe, spunky little Virginian who speaks with a Boston twang from fishing there for many years. He says, "Fishing's deteriorating just as fast as you can push it down the hill. Don't ask me why. They have fins and tails; they go where nobody knows."

Will the fisherman go, too? Probably in one guise or another, he will remain. The captain of a boat in Atlantic City says: "Today I'm a bum because I make a living from the sea. People hear I'm a commercial fisherman and they turn up their noses. They're snobs. Some day--I may not live to see it--the man of the sea will be respected. He'll provide the food that the world will subsist on."



FREEZING & IRRADIATION

"Freezing and Irradiation of Fish," edited by Rudolf Kreuzer, Fishing News (Books) Ltd., Ludgate House, 110 Fleet Street, London EC4, England, 1969, 528 + xvii pp., illus.

This is a record of the FAO Congress on the Freezing and Irradiation of Fish, Madrid, September 1967. The intention of the Congress was to provide the latest and most complete knowledge about the merits and capacities of refrigeration practices as a contribution to fuller utilization of the world's fishing catch for human food. While essentially scientific, this volume should be of enormous practical importance to all fish processors and distributors.

The book, divided into six main parts, includes 80 papers from probably the most experienced and authoritative scientists and technicians in the world. Much valuable and informative material from session discussions has been included.

The 6 main parts are:

1) Freezing fish at sea; techniques and equipment, factors affecting quality, freezing media, and superchilling.

2) Freezing and processing of frozen fish; physical effects of freezing, specific problems and techniques, effect of polyphosphate treatment, freezing tropical fish, and thawing of frozen fish.

3) Economics of producing and marketing frozen fish products; shore-based plants, economic considerations, and product development.

4) Quality of frozen fish products and its assessment; factors influencing quality and the measures of assessment.

5) Storage, packing, and distribution; design and operation of cold stores, and methods of packing and distribution.

6) Preservation by irradiation; quality, present status, production technology, and economic aspects.

FROZEN FISH

"Draft Code of Practice for Frozen Fish," Organization for Economic Cooperation and Development, Paris, 1969 (French and English), 74 pp., $1.80. Sold by OECD Publications Center, Suite 1305, 1750 Pennsylvania Ave., N.W., Washington, D.C. 20006.

This is a guide for industry on the treatment of fish and fish products before, during, and after freezing. It has been approved by the International Institute for Refrigeration and the OECD Fisheries Committee, and recommended to the WHO/FAO Codex Alimentarius Commission.

The code covers: raw material; freezing times and rates; sanitation and hygiene in handling and processing; packaging; storage; thawing; and transportation and retailing.

FROZEN FISH IN TRADE

"Market for Frozen Fish in OECD Member Countries 1964-1968," Organization for Economic Cooperation and Development, Paris, 1969, 120 pp., $3. Sold by OECD Publications Center, Suite 1305, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006.

The introduction of frozen fish as a commodity in international trade is comparatively recent. Modern mechanical refrigeration began in the late 1940s. By 1967, one million tons worth $400 million to the shippers had entered international trade.

This study concentrates on frozen products from groundfish caught in the North Atlantic fisheries. It includes specific studies of prices, product groups, production, trade, and consumption in the principal exporting and importing countries. There are fairly complete analyses of the situation in Canada, Denmark, Germany, Iceland, Norway, the U.K., and the U.S.--and shorter sections on France, Greece, Japan, Netherlands, Spain, Sweden, and Eastern Europe.

GEAR

"German One-Boat Midwater Trawl, Development Since 1959 to Beginning of 1968," by Joachim Schaerfe, 'Informationen fuer die Fischwirtschaft,' Vol. 15, No. 3/4, Hamburg 1968. Translation sold by Clearinghouse, U.S. Department of Commerce, Springfield, Va. 22151, 65 pp., $3 (microfiche 65¢). Order TT-68-50211.

Dr. Schaerfe is Chief, Gear Technology Section, Fishing Operations Branch, FAO. He describes the use of the one-boat midwater trawl in experimental work and in commercial fishing. The article also covers fishing conditions for herring, cod, hake, pollock, mackerel, and other species; fish behavior; fishing vessels, fishing efficiency and techniques; handling of catch on board; and gear--warps, trawl boards, bridles, front weights, headline floats, nets, and net sounders.

HYDRODYNAMICS

"Theoretical Hydrodynamics," by L. M. Milne-Thomson, Macmillan Co., New York, 1968, 743 pp., illus.

The science of hydrodynamics is concerned with behavior of fluids in motion. The object of this book is to give a thorough, clear, and methodical introductory exposition of the mathematical theory of fluid motion that will be useful in both hydrodynamics and aerodynamics. Dynamics of a frictionless fluid is a subject that has always been necessary to the naval architect.

As scientific theory becomes more exact, it tends to assume a more mathematical form. In a radical departure, the author has based his presentation consistently on vector methods and notation. The previous mathematical knowledge required of the reader did not go beyond the elements of infinitesimal calculus.

SONIC-SCATTERING LAYER

"An Investigation on Sonic-Scattering Layers; the R.R.S. 'Discovery' SOND Cruise 1965," by R.I. Currie, B.P. Boden, and E.M. Kampa, 'Journal of the Marine Biological Association of the U.K.,' Vol. 49, No. 2, pp. 498-514, 1969.

The SOND 1965 Cruise was designed as an ecological study of sonic scattering layers at a certain season in a restricted volume of ocean near the Canary Islands. The primary intention was to study the vertical distribution and migrations of animals in the upper 1,000 meters. Biological, acoustical, and environmental observations were essentially independent but closely coordinated. The scientists hoped the cruise could assess the potential of acoustical methods for general use in distribution studies and, at the same time, cast some light on the nature of acoustic scattering in the sea. This article is a preliminary report on the investigation and its methods.

The following, published by the Fish & Wildlife Service, Department of the Interior, are available from Division of Publications, BCF, 1801 N. Moore Street, Arlington, Va. 22209.

ALGAE

"Green Algae, Chlorella, as a Contributor to the Food Supply of Man," by Norman W. Durrant and Carol Jolly, Fishery Industrial Research, Vol. 5, No. 2, 1969, pp. 67-83.

Efforts to solve world hunger usually fall into two categories: 1) controlling population growth; and 2) increasing food production. Whenever the latter is considered, the possibility of large-scale culture of green algae arouses great enthusiasm. This paper is concerned specifically with the tremendous potential of algae for increasing food supply.

A primitive group of plants, algae are usually classified according to their color--green, blue-green, brown, or red. They all contain the chlorophylls essential for the production of organic matter. Brown and red algae differ considerably from green and blue-green both in size and structural complexity; their potential for artificial cultivation and effective use as food is less than that of green and blue-green.

The authors examine the supplies and utilization of all algae, but report on the green in greater depth--especially developmental investigations and production and nutrition studies.

BILLFISHES

"Billfishes of the Central Pacific Ocean," by Donald W. Strasburg, Circular 311, 1969, 11 pp., illus.

Swordfish

'Billfish' is a collective term embracing the various kinds of marlin, spearfish, sailfish, and the broadbill swordfish. These large fishes, some exceeding 1,000 pounds, are found in all warm seas. Despite their size, game qualities, and commercial potential, they are poorly known biologically. The data used in compiling this report were obtained from the records of the Hawaiian International Billfish Tournament, the Hawaii State Division of Fish and Game, and scientific literature.

PACIFIC MACKEREL

"Synopsis of the Biological Data on the Pacific Mackerel, Scomber japonicus Houttuyn (Northeast Pacific)," by David Kramer, Circular 302 (FAO Species Synopsis No. 40), 1969, 18 pp., illus.

Mr. Kramer has tried to assemble all existing knowledge on the identify (nomenclature, taxonomy, morphology), distribution, bionomics, life history, population, fishery, and protection and management of the Pacific mackerel.

SALMON & STEELHEAD

"Identification of Pacific Salmon and Steelhead Trout, by Scale Characteristics," by Kenneth H. Mosher, Circular 317, 17 pp., illus.

Identification of species of salmon (Oncorhynchus) and steelhead (Salmo gairdneri) in Pacific coast sport and commercial catches is important in assessing the relative production and value of each species. At times it may be necessary to determine the species from a portion of fish, such as a steak or fillet. Any scales on these portions offer a means of identification. The species differ from each other in their life histories, and some scale features clearly show this difference. Fishery inspectors, in the field or on shipboard, will be able to use this illustrated guide with a minimum of preinstruction.

OCEANOGRAPHERS

"Explorers of the Deep," by Donald W. Cox, Hammond, Inc., New Jersey, 1968, 93 pp., illus., $3.50.

This book should stimulate young people's interest in the oceans. It tells the stories of 18 "searchers of the sea"--biologists, geologists, engineers, and aquanauts--ranging from Ben Franklin, who was the first to study the Gulf Stream, to Willard Bascom, pioneer of the Mohole project.

--Barbara Lundy

INTERNATIONAL

British Sport Fishermen Blame Danes for Decline in Salmon Catch

British sport fishermen claim that poor 1969 salmon fishing in British rivers is due to Danish salmon catches off Greenland. They have started a campaign against the purchase of Danish products. Anti-Danish posters reading "Save our Salmon, Boycott Danish Food" have been displayed in the northwestern part of the country. English housewives are refusing to buy Danish butter and bacon.

Danish Ambassador Replies

Erling Kristiansen, the Danish Ambassador in London, said there is no evidence that Danish fishing off Greenland is responsible for the decrease in British salmon catches. Kristiansen is an avid sport fisherman himself. He added that about 1,500 metric tons of salmon are fished off Greenland annually, and 2,000 tons are caught off British coasts. In all probability, most salmon caught off Greenland originate from the rich Canadian salmon areas, he said. Kristiansen also called attention to the spread of ulcerative dermal neurosis (UDN) and the increase in illegal fishing with explosives. Danish trawlers also fish cod and halibut, and other countries fish in the area between Greenland and Scotland.

Charge Unproven

No one from the British Sport Fishermen's Organization has been able to establish any connection between the Danish fishery and the decrease in British salmon stocks. However, British sources point out that, at two conferences held this year in London, Denmark voted against prohibiting open sea salmon fishing. Sweden and West Germany also voted against a prohibition. ('Berlingske Tidende' and 'Børsen,' July 12.)

OECD Reviews 1968 Fisheries

Again in 1968, there was a slight overall improvement in North Atlantic and North Pacific fish catches. The increase resulted from better catches of fish for direct human use (up about 6%). The production of fish for reduction to meal and oil was smaller than in 1967 (down 4%) mainly because some herring fisheries failed.

On the whole, marketing conditions for bulk catches continued unsatisfactory. So fishermen often were no better off then in 1967, a year of poor returns.

OECD Review

The main 1968 fishery developments in the northern hemisphere are described in a Review of Fisheries in countries of the Organization for Economic Cooperation and Development (OECD): Belgium, Canada, Denmark, France, W. Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Turkey, U.K., U.S. These provide about half the world's fish supply and handle around three-quarters the global trade in fish and fish products.

Northern Countries Hurt

Affected most by low prices were the more northern countries: Iceland, Norway, Greenland, and Canada. Their fisheries depend considerably on outlets for frozen cod and similar species, and for fish meal and oil. These products all figure prominently as commodities in international trade and all were affected by poor demand.

In isolated cases--Denmark's reduction industry, for example--it was possible to increase productivity. As a rule, however, the condition of North Atlantic fish stocks allowed only marginal improvement.

More Government Aid

One outcome of the prolonged market depression is that governments have provided more financial aid. How many additional

provisions and their possible repercussions on international trade are now being examined in OECD by the Committee for Fisheries.

Market for Coastal Catches

In 1967, the adverse conditions in the external market had not affected unduly internal demand for high-quality fresh fish caught by coastal water home fleets. This was repeated in 1968. The OECD Review notes the high rate of vessel renewal in this sector--usually a reliable indicator of good economic health. (OECD, June 25.)

World Fish Meal Production and Trade Set Records in 1968

"World Agricultural Production and Trade," July 1969, published by the U.S. Department of Agriculture, contains this summary of world fish meal production and trade in 1968:

SUPPLIES

World fish meal exports (including meal equivalent of fish solubles) were a record 3.9 million short tons in 1968. This was a rise of 694,200 tons, or 22%, from 1967--and more than double the 1960-64 average. The marked increase reflected chiefly Peru's record anchovy catch. Also contributing were substantial recovery in Chile's catch and further expansion by Denmark, South Africa, and South-West Africa. However, herring exports from Norway and Iceland declined sharply.

World production increased by 330,000 tons, or 6.6%.

On Dec. 31, 1968, aggregate stocks of fish meal in primary exporting countries were estimated to be sharply lower. This was evidenced by the fact that world exports in 1968 increased nearly 400,000 tons more than production. In 1968, exports were 73% of 5.3 million tons produced; this compared with 64% in 1967--and only 60% during 1960-64.

IMPORTS

In 1968, fish meal imports into major markets of nearly 3.5 million tons expanded at an accelerated rate: nearly 24% above 1967. The average annual increase in imports during 1962-68 was 13.2%.

During 1960-68, aggregate imports by some countries have been substantially less than world exports. The annual unaccounted margin, though erratic, has widened sharply. A sizable part of unexplained difference was due to increased imports by nonreporting countries in Eastern Europe.

Of the 66,400-ton net increase in 1968 fish meal imports, the U.S. accounted for 30%, the European Communities countries 22%, the United Kingdom 16%, and Japan 10%.

U.S. imports, the largest market, were up 31% in 1968 to 855,800 tons, or 24.5% of aggregate. This compared with 23.1% in 1967 and only 15.4% in 1962.

In recent months, U.S. imports have declined. This reflects sharply higher prices for Peruvian anchovy meal. In January-May 1969, U.S. imports were only 203,144 short tons--compared with 327,000 tons in 1968 period. However, imports into West Germany--the second largest market--were steady during January-April at 218,500 tons. This compared with 216,200 tons in the 1968 period.

PRICES

The price for fish meal has increased substantially since Jan. 1969. In early July, it was US$168 a short ton c.i.f. European ports, or $36 above the same period a year ago, and $47 above the 1968 average annual price. Compared with a year ago, soybean meal prices have not changed appreciably. Therefore, fish meal has become less competitive with soybean meal. This could result in some shift toward heavier use of soybean meal in livestock and poultry rations.

CURRENT SITUATION AND PROSPECTS

Output in major producing countries through May 1969 was slightly less than in 1968 period. Exports were nearly equal to 1968 period despite stocks in major producing countries that are about a quarter-million tons below last year's.

Stocks are expected to be drawn down even more sharply before Oct. 1, when supplies from the 1969/70 season in Peru start moving into export. Since 1963, Peruvian production

in the Oct.-Dec. quarter has been erratic. It ranged between 366,000 in 1963 and 806,000 tons in 1967. Peruvian fish meal production during Oct.-Dec. 1968 was 659,000 tons. In the past, sharp price fluctuations have taken place in the Oct.-Dec. quarter; in 1967, European prices in Nov., at $120 ton, were down $35 a ton from Sept.

Record World Fish-Oil Production & Exports in 1968

In 1968, net exports of fish oil (including fish liver oil) were 757,800 short tons, or 42,100 tons above 1967 and more than double the 1960-64 average. The increase reflected phenomenal expansion in exports of Peruvian anchovy oil and South African pilchard oil; these were largely offset by sharp reductions in herring oil from Norway and Iceland. Much of overall increase in exports of fish oil reflected heavy disposal of stocks. These had been largely built up during big bulge of 1967.

1969 Outlook Clouded

The outlook for 1969 production is clouded as usual by several major uncertainties. The basic question continues: Will low Peruvian anchovy oil yields and a possibly smaller catch there--and reduced quota on S. African pilchard and herring scarcities in Norway and Iceland (if they continue)--more than offset expected increases in oil output from Chile and Denmark? Any substantial recovery by Norway and Iceland could result in another overall increase; if it occurs, it would set a new record.

Export Decline Expected

Although fish-oil output may continue near 1968 record, exports are expected to decline somewhat in 1969. Peru's exports, which in 1968 exceeded production substantially, are expected to be a major factor influencing this decline. However, movement from Chile and Denmark could increase somewhat. Exports from Iceland and Norway will likely remain substantially below 1966. Exports from S. Africa and South-West Africa are expected to continue large, but these may be somewhat below 1968 record. Sharp spurt in 1968 production of pilchard oil from S. African factoryships might not be matched in 1969 due to quota restrictions. In long run, key factor there will be whether present catch limit for pilchard can be maintained without depleting stocks.

Aggregate exports from major producing countries are running substantially less than in 1968 period.

Fish Oil Exports & Prices

In 1968, record fish-oil exports resulted in markedly lower prices. These averaged about 4.5 U.S. cents a pound for Peruvian, semirefined, c.i.f. European ports, compared with 5.8 and 8.9 cents in 1967 and in 1966.

However, prices in recent months have strengthened to 6.1 cents in June and early July. Although prices for most other oils also have strengthened from a year ago, price spreads or discount for fish oil in relation to most competing oils have narrowed substantially. Thus, fish oil prices have become less competitive in world markets. The notable exception is palm oil. This declined to about 7.3 cents a pound, Malaysia 5% bulk c.i.f. Europe, in July, compared with 7.8 cents a year earlier. ('World Agricultural Production and Trade,' U.S. Dept. of Agriculture, July.)

1968/69 Whale Catches in Antarctic & N. Pacific Reported

On June 13, 1969, the Japanese Fisheries Agency published data on 1968/69 whale catches in the Antarctic and North Pacific Oceans.

The 1968/69 Antarctic catches reflect about a 50% increase in fin whales over the previous season--but a 50% decrease in sei whales.

The Soviet Antarctic catches show practically no change for fin whales--but a decrease of 287 sei whales.

In the 1968 North Pacific mothership whaling, fin whale catches decreased 20% from previous season, sei whale hauls increased 10%, and sperm whale catches were virtually the same. ('Suisan Tsushin,' June 16.)

1968/69 Antarctic and North Pacific Whale Catches					
Type of Operation	Catch Quota	Catch			
		Fin Whale	Sei Whale	Total	Sperm Whale
	BWU[1]/	(Number)		BWU[1]/	Number
Antarctic mothership					
Japan	1,493	1,821	3,495	1,493	0
USSR	976	1,194	2,275	976.16	Not Available
Norway	731	0	0	0	0
Total	3,200	3,015	5,770	2,469.16	
North Pacific mothership					
Japan	-	729	3,819	1,001	3,000
USSR	-	1,062	1,100	714.33	9,526
Total		1,791	4,919	1,715.33	12,526
North Pacific land stations					
Japan	-	53	977	189.33	3,747
US	-	38	14	21.33	84
USSR	-	0	0	0	0
Canada	-	0	0	0	0
Total		91	991	210.66	3,831

1/Blue-whale units.

Japan to Aid Indonesian Fishery Research & Training

Japan has signed a 3-year agreement with Indonesia to provide technological and material cooperation for Indonesian fisheries research and training projects, according to the Foreign Ministry. The agreement is part of Japan's official program of technological cooperation with Indonesia.

Japan will send 4 fisheries experts and provide some machinery and equipment for Indonesian fisheries research and training institutes. ('Japan Times,' July 11.)

IAFMM Conference Held in Cannes

The International Association of Fish Meal Manufacturers (IAFMM) celebrated its tenth anniversary at the 9th Annual Conference, held in Cannes, October 6-10. Over the past 10 years regular conferences have been held where producers and scientists advising the industry meet to discuss matters of mutual interest. The Executive Council and the Scientific Committee also meet at least once a year between conferences.

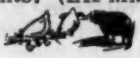
Member Countries

IAFMM member countries are Belgium, Canada, Chile, Denmark, France, Germany, Holland, Iceland, Morocco, Norway, Peru, Portugal, South Africa, Sweden, U.K., and the U.S. Other major producing countries are invited to participate in conferences as observers.

IAFMM Activities

The Association does not engage in actual marketing or price questions. It is primarily concerned with assembling economic, statistical, and general marketing information. The Scientific Committee constantly examines methods of improving processing and quality control to ensure production of high-quality fish meal. The Association has liaison status with FAO, and FAO representatives participate in all conferences and meetings. It cooperates with the Fish Meal Exporters Organization (FEO) in market promotion and technical activities. It maintains close contact with leading fishing industry research institutes.

A symposium for compounders was held in Amsterdam on October 2. Scientists, producers, and technicians in the compounding industry presented papers on fish meal processing, assessment of protein quality, fish meal in poultry rations, fish meal in pig rations, and new developments, such as the use of anti-oxidants. (IAFMM, Aug. 4.)



First Fish-Inspection Conference Held in Canada

The Technical Conference on Fish Inspection and Quality Control, organized by the Food and Agriculture Organization in cooperation with Canada, concluded an eleven day session in Halifax on July 25. About 250 delegates from 45 countries participated.

General Agreements

The Conference, first of its kind, examined the scientific, technical, and legal aspects of fish inspection and quality control. It agreed on the need for efficient, scientifically based inspection systems to assure the highest quality of fish and fish products in the interest of consumers and the fishing industry. It was emphasized that better quality control would also help to reduce wastage and facilitate exports, especially by developing countries.

Individual Country Programs

It approved recommendations to establish suitable inspection programs in individual countries, including education and training of personnel. The Conference discussed the question of whether fish-inspection programs should be voluntary or mandatory; it decided this depends on circumstances in each country. In any case, it was emphasized that there should be "no compromise in matters affecting public health".

Glossary

The Conference also recommended that FAO publish a glossary of terms used in fish inspection and quality control which could be applied internationally. The glossary would facilitate understanding by establishing a common language in a very complicated field.

Spoilage

Finally, the possibility of detecting fish spoilage through chemical means was noted. The most promising is trimethylamine, which develops during spoilage of fish, though this method applies only to certain marine species.

Some speakers called for greater research into fish spoilage and development of quick, efficient methods for its detection. Others, especially from developing countries, emphasized the need for education and training. The participants agreed that the trend is towards more stringent standards for fish quality, and that consumers are becoming more demanding. C. H. Castell, Fisheries Research Board of Canada, predicted that spoilage of fish after catching will be reduced to insignificance eventually, thanks to modern scientific advances; also that consumers will enjoy the same high standards for fish and fish products they now expect and get from meat and poultry products.

General Topics

Almost 100 papers on various aspects of fish inspection and quality determination were discussed. General topics were: the need for inspection and quality control; national fish-inspection programs; general principles and program development; industrial advantages of inspection and quality control; research reports on methods for quality assessment.

USSR Conducts Joint Oceanographic Research With Japan & France

The first Soviet-Japanese oceanographic research team, aboard the 'Hakiko Maru', concluded a 1-month study of the Sea of Japan seabed on June 28. Thirty scientists from the Soviet Academy of Sciences' Institute of Oceanography and oceanographers from Japanese universities conducted geological and geophysical research to obtain data on the origin of the Sea of Japan.

Soviet-French Research

A party of Soviet and French oceanographers left Sevastopol, USSR, on June 28 for a joint research cruise in the Mediterranean. The French scientists went aboard the 'M. Lomonosov' of the Ukranian Academy of Sciences' Marine Hydrophysical Institute. At the same time, Soviet scientists entered an underwater laboratory designed by Jacques Cousteau for joint underwater research. Both programs are part of a French-Soviet Scientific Cooperation Agreement.

FOREIGN

CANADA

FISHERIES MINISTER URGES INCREASED PENALTIES FOR FOREIGN VESSELS FISHING INSIDE 12-MILE LIMIT

Canada should increase the penalties levied against foreign vessels caught fishing inside the 12-mile zone, says Fisheries Minister Jack Davis. He believes current maximum fines under the Coastal Fisheries Protection Act "are not a sufficient deterrent. We should be free. . .to extract greater penalties for repeated offenses." Maximum fines now are C$5,000 for a summary conviction, or $25,000 for conviction on indictment.

4 Vessels Fined

Davis said the maximums are outdated, but declined to spell out what he considered would be reasonable fines. The highest penalty levied this year, against a Japanese vessel caught inside the limit off British Columbia, was $3,500 and loss of catch. Another Japanese boat and two Russian trawlers were fined $2,500 each.

The Minister said the matter of increased fines would probably come up at the next sitting of the Commons in Ottawa. "At the very least we should bring all the legislation up to date," he added.

What Act Provides

Under the act, it is an offense for a foreign fishing vessel to be inside the limit, except in case of emergency. The act also provides for confiscation of fish, boat, and gear. "The confiscation of the catch inside territorial waters will continue," Davis said. (Canadian Embassy, Aug. 26.)

* * *

SOVIET TRAWLERS SEIZED AND FINED

On August 4, a Canadian Fisheries Enforcement vessel seized 2 Soviet medium side trawlers 9.4 miles off the Canadian coast. Both vessels were within the 12-mile limit, near Cleland Island, west of Vancouver Island. The captains and crews were arrested, and the 'Gherman Titov' and the 'Kuzachin' escorted to Victoria, B.C., for inspection and legal charges. Canadian law allows a maximum fine of C$5,000. The vessels may be confiscated.

Captains Fined

On August 11, the Victoria Court fined each captain C$2,500. Both pleaded guilty, blaming their violation on nets threatening to foul the propellers and the strong onshore current. Both also claimed that Soviet vessels have standing instructions to remain a minimum of 1.5 miles seaward of the 12-mile limit. Although no fish were found on board, the Court contended that the vessels were preparing to fish because their nets were in the water. The Canadian press noted that this was the first time Soviet fishermen had been found guilty of fishing illegally in Canadian waters. (U.S. Consulate, Vancouver, Aug. 4 & 11.)

* * *

SALMONID IMPORTS RESTRICTED

A new Canadian law prohibits imports of live or dead salmonids or salmon eggs, unless they meet specific requirements, to protect against the spread of disease. Similar legislation became effective in the U.S. in mid-1967.

The New Law

The Canadian legislation defines 'salmonid' as fish of the family Salmonidae. Live or dead salmonids, or salmonid eggs, may be imported only if (a) they have been processed by a method that destroys the protozoan 'Myxosoma cerebralis' and the virus causing viral hemorrhagic septicemia; or (b) they are accompanied by a certificate, signed by a fisheries pathologist in the country where the fish were caught, stating that the fish or eggs are free of 'Myxosoma cerebralis' and the viral hemorrhagic septiciemia virus. A specimen of the pathologist's signature must be filed with the Department of Fisheries and Forestry in Ottawa.

The regulations do not apply to salmonids caught in the wild in North America. ('Fisheries Council of Canada Bulletin,' July-Aug.)

* * *

Canada (Contd.):

KELP PROCESSING STARTED IN BRITISH COLUMBIA

A 1,000-ton kelp cutter vessel has been launched and a plant built at Masset on Canada's Queen Charlotte Islands to process 40,000 short tons of kelp this year and 200,000 tons in 1970.

The product will be algin, used in ice cream, chocolate milk, cheese, icings, salad dressings, candy, puddings, aspirin tablets and other pharmaceuticals, paint, tires, food packages, and adhesives. Also produced will be kelp meal for fertilizer, animal feed, and for humans.

The New Plant

At the new plant, chopped kelp will be pumped from the harvesting vessel into two 600-ton-capacity storage tanks. From there it will be washed in fresh water and fed into shredders. The shredded kelp will be led into a hot air stream. A collecting cyclone there will drop the diced kelp into a 50-ton silo. From the silo the kelp will be ground and bagged.

Storage capacity of the warehouse is 2,000 tons of bagged kelp meal in pellets.

Each ton of wet kelp harvested will produce two 100-pound bags of kelp meal; 2,000 pounds of dried kelp meal are required to extract 400 pounds of algin.

No Canadian Market Yet

According to the British Columbia Research Council, the market for alginates in Canada has not been established. Gross sales of seaweed colloids in the U.S. have been estimated at $10-$20 million a year. ('Sea Harvest and Ocean Science,' Aug.-Sept.)

* * *

FIRST-HALF 1969 MARITIME PROVINCES' LANDINGS ABOUT SAME AS 1968

Landings in Canada's Maritime Provinces for first-half 1969 were 427 million pounds worth C$34.4 million. Statistics for the same period of 1968 were 431 million pounds, C$33.3 million; for 1967, 299 million pounds and C$25.3 million.

June 1969 Catch

June 1969 landings were 140.4 million pounds worth C$11.5 million. Included were 51.6 million pounds of groundfish, C$2.5 million; 73.1 million pounds of pelagic and estuarial species, C$7.1 million. The quantity and value of the June catch were above June 1968 by 27.4 million pounds and C$2.3 million. The catch also was above the 3-year (1966-1968) June average by 35.8 million pounds and C$2.8 million.

Species & Vessels Used

During June, landings of cod, redfish or ocean perch, flatfish, mackerel, herring, swordfish, scallops, and lobsters were above the 1966-1968 June average; landings of haddock, halibut, pollock, and salmon were below the 3-year average.

Landings by trawlers and draggers over 70 feet long totaled 29.1 million pounds. Their catch represented 53.7% of groundfish landings and 85.8% of scallop landings. (Department of Fisheries & Forestry, Halifax, N.S., July 24.)

* * *

FISHING RETURNS TO NORMAL IN NEWFOUNDLAND'S PLACENTIA BAY

Normal fishing resumed in Newfoundland's Placentia Bay, Jack Davis, Canada's Fisheries and Forestry Minister, announced. Phosphorus pollution from the plant at Long Harbour forced closure in early May of a large Bay area. The fishery was reopened June 16. Since then, the Department bought all fish.

The area's fishery products have been declared safe for human consumption. The Department's purchases were scheduled to end July 12. Its 'buy program' permitted smooth transition to normal operations.

Fish Tested

All fish at time of closure were bought by the government and destroyed. Fish caught after the reopening on June 16 have been purchased and held by the government to permit exhaustive tests by the Food and Drug Directorate of Department of National Health and Welfare. (Canadian Dept. of Fisheries and Forestry, July 1.)

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EUROPE

United Kingdom

LARGER FISH SUPPLIES EXCEED DEMAND

Britain's deep-sea fishermen increased their catch in 1968, but supply was not matched by demand. The White Fish Authority (WFA) announced this in its report for the year ended March 31, 1969.

All 3 sections of the deep-sea fleet increased landings. But only the middle-water operators escaped a drop in revenue. The average value of landings by deep-sea vessels declined more than 3%.

There are 3 categories of vessels in the deep-sea fleet: distant-water (more than 140'), middle water (110' to 140'), and near water (80' to 110').

Deep-Sea Fleet Declined

During 1968, the deep-sea fleet lost 34 vessels. WFA approved only one grant to construct a vessel more than 80 ft. long. Its report states: "It is to be hoped that improved profitability, assisted by the new subsidy arrangements, will encourage owners to undertake new building during the coming year."

Inshore Fleet

For the inshore fleet, it was a more favorable year. Landings were slightly up. The average value was 5% above 1967. One seiner and 63 trawlers were added to the fleet.

Fresh & Frozen White Fish

In 1968, supplies of fresh and frozen white fish, excluding shellfish, were 929,559 metric tons worth US$175 million. Of that, imports were 165,966 tons valued at US$44 million. Compared to 1967, supplies increased 36,311 tons and value US$5.7 million; increased imports accounted for 20,760 tons worth US$4.6 million.

Of 383,000 tons used for fish meal, 232,200 tons were offal, 1,600 tons condemned fish, and 59,000 tons surplus fish with no buyers.

Fish Exports

Fish exports rose more than 6,000 tons (21%). This was an increase of 22% in value to US$21 million. Shellfish landings were worth US$11.6 million, compared with US$9.6 million for 1967.

Loans to the industry during 1968 were US$1.3 million. These included US$1 million for construction and replacement of motors of inshore vessels. US$355,000 went for processing and ice plants. Gross expenditures on grants for vessels were US$8.6 million. (Charles Barker City Ltd., June 24.)

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RANGER CO. PLANS INCREASE IN TRAWLER FLEET

If fleet-expansion plans of Ranger Fishing Co. of North Shields are approved by the White Fish Authority (WFA), a Lowestoft shipyard will get the most valuable single order yet placed by a British trawler owner--about US$7,680,000 for four 215-ft.-long factory stern trawlers.

The firm already has 3 factory trawlers. It has been considering an increase. WFA approval is necessary to get the 35% building grant. In this case, it would amount to more than $2,400,000. This probably would be spread over the 2- to 3-year building period.

The Ranger Fleet

The 3 vessels in the Ranger fleet were built in 1965 and 1966. They are small factory trawlers 171 ft. long with a fish hold capacity of 13,000 cu. ft. In the 3½ years since they first entered service, the firm has accumulated considerable experience. Its dock has been modernized. It has put up a cold store able to hold 800 metric tons of fish landed in fillet packs ready for distribution to fish friers.

Factory Trawler Operations

While the trend in other large British trawler ports has been towards the whole fish freezer, North Shields now seems destined to become the base of an efficient factory trawler operation. This includes a

United Kingdom (Contd.):

Ranger Training Center at the fish quay, where recruits are given instruction in specialized work aboard the factoryship. ('Fishing News,' May 23.)

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SCOTTISH BOARD HAS INVESTED US$3.6 MILLION IN FISHERIES

The Scottish Highlands and Islands Development Board reports that it had invested US$3.6 million in the fishing industry since Nov. 1965; $485,854 in grants; $3,083,926 in loans, and $48,000 in equity participation. The investment has provided 850 jobs, half sea-going.

About $1,965,600 directly assisted vessel purchase; the remainder went to shore-based projects.

Board's Report

The Board assisted catching, ancillary trades, processing, and fish farming.

Of the 24 new vessels approved--19 for the Western Isles fleet--15 had been launched and were fishing; 5 were under construction. Sixty-two fully experienced fishermen had been helped to buy secondhand boats. Although these have a shorter working life, they created jobs at a lower overall cost than most other assistance.

The Board helped purchase 10 new 16-ft. seaweed boats. Their yield raised productivity of the 3 processing factories in the Western Isles by an estimated 15%.

The Board approved building 20 "dual purpose vessels"--lightly built boats up to 35 ft. which can be used for creel-fishing, tourist trips, sea-angling, or short-distance ferrying. Seven of these had gone to Caithness County because of the great interest in sea-angling there.

Ancillary Trades

Before the Board adopted its various schemes, the boatyards had been limited basically to their local markets. The problems of transport, cost, and basic communications had worked against expansion. Now the market extends to all 7 crofting counties. The $336,000 invested provided 99 jobs.

Thirty vessels, 28 under 35 ft., had been built, or were on order. Help to other ancillary industries totaling about $117,600 involved 38 jobs, including marine engineering and ice-making. ('Fishing News,' May 23.)

Norway

STATE SUPPORT FOR FISHERIES IS INCREASED

Increased state support to the Norwegian fisheries for June 1, 1969, through May 31, 1970, has been approved unanimously by the Storting (Parliament). As in previous years, the bill was based on negotiations between the Norwegian Fishermen's Union and the Ministry of Fisheries. State subsidization of fisheries is estimated at US$35.7 million for the year ending May 31, 1970. This does not include the extraordinary support measures for the stockfish industry previously adopted.

1969/70 Aid High

The 1969/70 fisheries subsidies are US$3.5 million higher than those originally voted for 1968/69. However, including aid to the stockfish industry (US$4.2 million), fishery payments were officially estimated at US$36.4 million in 1968/69.

Other Aid

The Storting also approved a US$2.8 million loan arrangement for owners of fishing vessels hit hard by failures in major fisheries in 1968/69. A similar arrangement of US$1.4 million was voted for herring curers affected by the complete failure of this year's winter herring fishery. (U.S. Embassy, Oslo, July 1.)

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USES MORE SEA WEED

A new factory using sea weeds as raw material is operating near Haugesund in southern Norway. Owned by Protan & Fagertun, it will produce 1,000 metric tons of alginate a year. Using its older factory and the new one, the firm now can produce 15% of world's need for alginate. It is the world's largest company of its kind.

Norway (Contd.):

The Firm's Operation

The firm has a new experimental trawler and 8-10 other vessels gathering sea weeds for alginate production. It employs 300 persons; 1,500 other persons gather sea weeds.

As much as 95% of production is exported. The textile industry is one of the largest buyers of alginate. It uses the product to thicken and print textiles with special colors. The food industry, another important buyer, uses it as an ingredient in jelly, instant desserts, and ice cream. The paper industry, a major customer, uses it in surface treatment of paper and cardboard.

Exports to developing nations are increasing. Eastern Europe also is becoming a large customer. The company is working to increase sales to the U.S. ('News of Norway,' June 23.)

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POLAR COD FISHERY DEVELOPS

Norway is rapidly developing a new industrial fishery for polar cod in Arctic Ocean. These fish are suitable for meal and oil--not human use. So far, 20 to 30 boats have caught 2,325-2,790 metric tons. Biggest single catch was 558 metric tons. ('News of Norway,' June 23.)

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FROZEN FISH EXPORTS TO U.S. RISE

Norwegian exports of frozen-fish products to the U.S. are expected to be 25,000 to 30,000 metric tons this year. Annual exports before 1967 were about 7,000 tons.

Partly responsible is Nordic Group, a combination of 21 companies in the frozen fish business. In its first year of operation, it has exported 8,000 tons.

Total Nordic Group exports for 1969 are expected to be 12,000 tons, nearly half national total. A large part of export products, such as "haddock fillets," had not been produced in Norway. ('News of Norway,' June 23.)

Denmark

INDUSTRIAL FISH LANDINGS DOWN IN EARLY 1969

Unusually poor weather caused a considerable drop in industrial fish landings in early 1969. In 1968, the fishery had started on January 2, but this year it did not begin until April. Landings in first 4 months were 194,000 metric tons, a drop of 68,000 tons from the 262,000 landed in same period 1968. Even if the remainder of the year should prove unusually profitable, the loss can not be made up. The largest decrease was in April, when catch reached only about 35,000 tons. It had been 77,000 tons in April 1968.

Fish Meal & Oil

Fish meal and oil production dropped markedly as a result of the light landings. Exports of herring meal were 62,500 tons worth US$890,000 in first 5 months 1968. ('Børsen,' July 15.)

Greenland

HER FIRST MODERN TRAWLER WILL TRAIN LOCAL FISHERMEN

Greenland's first modern trawler 'Nuk' will help Eskimos become up-to-date fishermen. Nuk, registered in Godthaab, will be a training vessel. Initially, she will be manned by Faroese who will teach the Eskimos to operate her.

Cost and Construction

The vessel cost about US$1.2 million, including US$360,000 for equipment. She is 164 ft. long, 31 ft. wide; depth to main deck is 15 ft., deadweight 433 gross tons, and speed 15-16 knots. Constructed as a shelter decker with elongated afterend, she is equipped with trap nets and floating trawl. Before she sailed to Greenland, tests were made with the 'net-sonde' equipped trawl.

Processing Equipment

The 300-cubic meter storage compartment below is insulated. The work deck has 9 hydraulic movable bleeding tanks, gutting

Greenland (Contd.):

tables, cutting and gutting machines, washers, and cold-storage equipment. Conveyor belts connect the bleeding tanks to the storage room. The fish hatches and stern gate move hydraulically. Final processing will take place at land-based plants.

Operating Plans

The vessel will operate primarily on fishing grounds off Greenland's west coast, making relatively short trips. Depending on the success of the experiments and training, other Nuk-type trawlers may be constructed. ('Fiskaren,' May 5.)

Iceland

PROMINENT ICELANDERS VISIT U.S.

The Icelandic Freezing Plants Corp., one of the country's major fish-exporting firms, organized a visit to the U.S. in late Sept. for about 90 persons. The trip marked the 25th anniversary of the Coldwater Seafood Corp. of Scarsdale, N.Y., and Cambridge, Md., the U.S. affiliate.

Prominent Visitors

Participants included officials of the Ministry of Fisheries and its Economic Institute; journalists; representatives of the Central Bank and 2 principal commercial banks; and directors of the 60 fish-processing plants that are corporation members. (U.S. Embassy, Reykjavik, July 24.)

West Germany

TRADE MINISTER OUTLINES FISHERY POLICIES

The West German Minister of Trade has issued this summary of his nation's fishery policy and its concern with the proposed European Communities (EC) fishery policy:

"West Germany's Common Market partners are today already large purchasers of German fisheries products and the trade within the EC will expand even more as the remaining barriers are removed. At the present time, we can not foresee the effects of the planned market organization for fisheries products. The Federal Government is skeptical toward the EC Commission's proposals with respect to a common fisheries policy because such proposals would imply a centrally directed structural policy and a complicated system for protection of prices based on public funds. The proposals are to a considerable degree based on already existing market arrangements--far from having been successful in all aspects--and therefore are subject to an extensive revision. Before conclusive evidence of such a revision is reached, we cannot determine any new market arrangements."

Wants Simple System

"The Federal Government advocates a simple and liberal system which should be limited to the most important fish species. We must consider the Regional differences in the fishery of the Atlantic Ocean, the Mediterranean, and the coastal waters of the Associated African states. The responsibility of the fishing industry must be based on efforts to stabilize the market as well as the prices. Therefore, establishment of producer organizations should be encouraged. The Federal Government is a definite adversary to public intervention efforts in the fisheries sector because such efforts after experiences with market support under the German fisheries law lead to a large-scale fishery without consideration to demand."

Recommends Coordinated Efforts

"Of particular importance for a well arranged and outlined marketing place for fisheries products is unity in quality norms, packaging, sorting, etc. Because EC is in need of fisheries products, the aim should be toward achieving liberal arrangements in relation to their countries. While negotiations take place with the most important supplier countries, EC should stabilize unity arrangements of the reference price system, for example like those which have been practiced successfully in the herring trade between Denmark and the Federal Republic. In principal, the structural policy should be the private matter of each member country within a certain frame so that distortions in

West Germany (Contd.):

competition may be avoided. Through closer cooperation, the possibilities of creating more effective fisheries protection and research work will be greater. A coordination of efforts from each member country would strengthen the EC's economic and political importance in international unity. Aside from some unavoidable transitional difficulties, the Common Market would generally offer advantages to the German fishing industry."

Optimistic About Future

In conclusion, the Minister of Trade said the German fishing industry is adjusting to changed conditions. He is encouraged by its knowledge and willingness to face future problems. "In view of the fishing industry's position to the problems, I find it easy to recommend assistance supplementary to one's own efforts." ('Fiskets Gang,' May 8.)

France

THEY ARE EATING
MORE FRESH FISH

Frenchmen are the most voracious fresh-fish eaters in the European Community (EC), according to the Community's statistical office.

In 1967, Frenchmen averaged 33.9 pounds of fresh fish, compared with 27.1 pounds in Belgium, 25.1 pounds in Italy, and 21.8 pounds in Germany and the Netherlands. In 1967 the Community averaged 26.7 pounds per person, compared with 23.8 pounds in 1960.

1967 EC Landings Down

In 1967, landings of fish by Community fleets were slightly lower than in 1966. This resulted largely from a 10% decline in herring catches.

This decrease was offset partially by an 11,000-ton rise in German cod catches which were 80,000 tons in 1967. ('European Community,' July.)

USSR

BLAMES JAPANESE FOR DEPLETING
PACIFIC HERRING & FLOUNDER

Herring and flounder stocks off Soviet Far-Eastern shores--traditional grounds off Kamchatka and Sakhalin--are in jeopardy because of intensive, uncontrolled Japanese fishery for immature herring and groundfish. This was stated bluntly by the official organ of the Soviet Fisheries Ministry, 'Rybnoe Khoziaistvo,' No. 6, 1969.

The situation has become so grave that people whose livelihood depends on these species face serious economic consequences unless drastic measures are taken to save the resources.

Soviet Suggestion

The Soviets suggest these steps as a minimum remedy: 1) Stop 1969 fishery for immature herring in Shelikhov Bay (Okhotsk Sea, west of Kamchatka) north of line from Cape Utkolokskii to Cape Tolstoy; stop this fishery in Karaginskii Bay (Bering Sea, east of Kamchatka) north of line from Cape Oliutorksii to Cape Ozernyi. 2) Discontinue flounder and other groundfish fishery off western Kamchatka--between 53° and 58° N. lat. at depths less than 100 fathoms in winter, and less than 50 fathoms in other seasons.

Unilateral Soviet measures restricting their herring and flounder fisheries are no longer sufficient to save resource; Japanese cooperation is imperative.

Another Soviet Complaint

The Soviets also complain about preemption of the fishing grounds: 70 Japanese vessels in Shelikhov Bay had gill nets extending over 60 miles in May-June 1967; over 140 Japanese vessels in May 1968 had nets extending over 250 miles in Korf and Anapka Bays.

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SCIENTISTS PESSIMISTIC ABOUT
FUTURE OF NORTH SEA HERRING STOCKS

Scientists of the Soviet All-Union and Atlantic Fisheries and Oceanography Research Institutes (VNIRO and ATLANTNIRO) warn that prospects for the North Sea herring fishery are "bleak" unless--(1) the immature

USSR (Contd.):

herring fishery is discontinued; (2) the fishery for maturing herring is strictly controlled; and (3) bottom trawling for mature herring on spawning grounds during larvae and fry reproduction and growth is reduced or stopped.

Soviets Say Stock Overfished

The Soviets say the stock is overfished. Any increase in effort will have negative effect on quality, quantity, and biology of North Sea herring populations.

The Soviets blame the 1964-66 expansion of Norwegian purse seining for depleting the maturing herring of the 1963 year-class. The harvestable 1960-class that replenished stocks in 1963-64 declined considerably in 1966-67; the abundant 1963 year-class fished intensely in 1964-66 lost commercial value by 1967-68. This is reflected in North Sea herring catches, which increased from 932,000 metric tons in 1963 to over 1.4 million tons in 1965; the catches dropped to 706,000 tons in 1968.

Soviet catch data are exclusive of Bløden Bank, where the West Germans and Danes annually take 100,000 tons of immature herring.

Further declines in North Sea herring fishery must be expected. ('Rybnoe Khoziaistvo,' No. 5, 1969.)

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GRAPPLES WITH
WATER POLLUTION PROBLEMS

A Soviet official writing in 'Izvestiia' on July 7 called public attention to water-pollution problems caused by industrial waste. He decried uncontrolled dumping of waste that endangers fresh-water supplies and produces "irreversible" biological changes in fresh-water and marine life.

Exortations, even legal regulations prescribing use of water per unit of factory output, are being ignored, the official said.

Proposes Water Tax

He suggested the solution would be to end "free water" and begin to tax industrial enterprises for the use of water. He proposed "differentiated taxes." Plant managers would be forced to speed construction of water-purification facilities. Price of water would vary from region to region and depend on availability and demand for water.

Suggests New Control Agency

Finally, the author calls for formation of a new ministry-level agency to deal with pollution problems.

One major beneficiary of any new regulations would be Ministry of Fisheries. For years, it has led the fight against waste-discharging enterprises on river shores and coasts of Caspian and Black Seas.

Purification Expensive

Research and planning groups are concentrating on introducing new techniques for water purification. Building costs of waste-processing facilities are extremely high--sometimes 30% of original construction cost of a plant. Costs run as high as 31 to 36 U.S. cents per cubic meter of waste water.

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OIL-OXIDIZING BACTERIA FOUND
IN WATER POLLUTION RESEARCH

The Ukrainian Academy of Sciences Institute of Hydrobiology at Kiev has published a paper on microbial oxidation of oil products in the Danube. Soviet scientists isolated and identified cultures of oil-oxidizing bacteria (machine and various mineral oils); most were genus Pseudomonas. The distribution and oxidizing properties of 26 species were studied. The capability of some species to oxidize hydrocarbon compounds of oil was found for the first time. ('Gidrobiologichekii Zhurnal,' Vol. 5 (No. 3) March.)

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USSR (Contd.):

KRILL PASTE IS SUCCESSFUL ON MOSCOW MARKETS

The All-Union Fisheries and Oceanographic Research Institute (VNIRO) has developed a commercial paste from Antarctic krill "rich in proteins, vitamins, and minerals." The paste, under the brand name "Okean," is selling well in Moscow. It has a pleasant taste and aroma, somewhat like shrimp.

According to VNIRO, the paste has this chemical composition: moisture 65-75%; fats 3-10%; nitrous substances 15-20%; carbohydrates 2%; ash 1.5-3.0%. It also contains potassium, iron, manganese, zinc, etc. Analysis by VNIRO's Laboratory of Fisheries Technology reveals that krill is high in essential amino acids like arginine (9.1%), lysine (12.8%), leucine (16%), and phenylalanine (6.8%).

Fishing & Processing Developments

Other Soviet sources report that Antarctic krill stocks are "practically unlimited". VNIRO is developing a "special trawl for krill fishing"--and a mechanized processing line to produce a semiprocessed krill product with 50% protein content.

Promotion

'Rybnoe Khoziaistvo,' No. 5, 1969 (official organ of the Soviet Fisheries Ministry) carries a full-page ad recommending use of krill paste in sauces, cheese spreads, and hot dishes. The Ministry also recently mixed krill paste with cheese (10% krill, 90% cheese) and claims the product is selling rapidly in Moscow food stores. Its brand name is "Korall."

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FISHING FLEETS NOW BASED ON CANARY ISLANDS

Spain has agreed to allow Soviet fishing fleets in the Southern Atlantic to base at the port of Santa Cruz de Tenerife in the Canary Islands. A 'Manchester Guardian' correspondent reported from Madrid that details were worked out early this year, but revealed only in early August. At that time, a Soviet delegation at Santa Cruz signed the contract to use the port's facilities.

Equality With Japanese

The agreement will put the Soviets on equal footing with the Japanese, who have operated about 100 fishing vessels for several years. It has been estimated that over 200 Soviet fishing and support vessels are in the southeastern Atlantic. ('Washington Post,' Aug. 11.)

The official Spanish news agency CIFRA announced "semiofficially" that the Soviets were scheduled to begin using Santa Cruz before the end of August.

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EXPORTS HERRING TO JAPAN

Negotiations to import Soviet herring were concluded in early April by the 11-company Japanese Corporation for Import of Soviet Herring and DALINTORG (Soviet Far Eastern Trade Office).

The USSR will export 7,000 metric tons of fresh and frozen herring to Japan in 1969. In return, she will import fishing gear, fish finders, work clothes, fruits, and household materials. It was the largest transaction for this type of trade made by the two countries.

Prices

According to the Federation of Hokkaido Fisheries Cooperative Association, the import price for 4,000 tons of fresh herring was set at US$125 a metric ton, or $3 above the 1968 price. The fish are to be received by Japanese carrier from Soviet vessels on the fishing grounds. Frozen herring (3,000 tons) will be delivered to Wakkanai at $220 per ton, or 25 dollars above the 1968 price. Total 1969 imports would be 2,500 tons above 1968's.

Alaska Herring

The herring import quota is 8,000 tons for this year. To fill the balance, Mitsubishi Shoji began negotiations to import 1,000 tons of frozen herring from Alaska. The 1,000 tons at $200-210 a ton were scheduled to be imported into Japan by the end of May or early June. ('Minato Shimbun,' Apr. 8.)

LATIN AMERICA

Cuba

REPORT ON FISHING INDUSTRY TRENDS

During the 1969 Spring Fair at Leipzig, East Germany, the correspondent of the British 'Fishing News International' interviewed the Cuban delegation.

Some interview highlights:

(1) Cuba and East Germany seem bent on increasing cooperation to develop the Cuban industry. E. Germany may possibly replace some Soviet fishery aid Cuba has received over the past 9 years;

(2) Cuban shrimp fishing will be concentrated in offshore waters, off Guyanas, and in Gulf of Mexico;

(3) Fishing vessels delivered to Cuba by E. German shipyards will be paid for by Cuban fishery exports (E. Germans especially want tuna);

(4) Processing and freezing capacity of Cuban industry has quadrupled in past few years;

(5) A School of Fishing to provide pupils and apprentices for expanding fleets has been organized. Over 5,000 pupils with elementary education are attending classes. A new Fisheries College trains captains, navigators, engineers, technologists, and electronics specialists;

(6) Cuba is assisting Guinea. It is running a training school at Conakry. Cuba also plans to aid fishing industries of developing countries in Central and South America, but details were not disclosed.

Buying Vessels

In July 1969, the Cuban high-seas fleet had 143 vessels: about 30 were fishing tuna; 90 were new shrimp trawlers bought from Spain. On order are 5 stern freezer trawlers and 15 'fish meal cutters' from E. Germany, 30 shrimp vessels from France, and a few vessels from Spain.

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SALTED COD INDUSTRY DEVELOPS

Dried and salted cod, a traditional dish in Cuba, is an important factor in supplying the protein needs of the people. Heretofore, cod was imported, but now Cuba is developing her own fisheries and establishing her own salting industry.

FAO Aid

The government of Cuba has asked for FAO assistance to improve all areas of cod production--catching, preparation and salting, and product distribution. Salted cod is produced primarily for domestic consumption; other Cuban fisheries cater to the export market.

Production

Annual capacity of existing salted cod plants in Cuba is about 5,000 metric tons; most is produced by one plant in Havana. With a new plant under construction in Antilla, it is hoped that production will reach 20,000 metric tons. The new plant production will equal current imports. ('Industrias Pesqueras,' Apr. 15.)

Chile

FISH-MEAL PRODUCTION DECLINED IN JAN.-APR.

North Chile's anchovy catch and fish-meal production continued to decline from January through April. This followed the trend of the previous 2 years.

For the first 4 months of 1969, the 4 plants in Arica averaged 15 working days per month; the 9 Iquique plants 16 days per month; and Antofagasta averaged 10, 17, and 22 working days per month.

Protein content of anchovy meal averaged 65%. Prices c. & f. per metric ton were: US$132-146 in January; US$142-145 in February; US$130-140 in March; and US$110-132 in April. (Instituto de Fomento Pesquero, Informe Mensual Nos. 2, 3, 4, 1969.)

ASIA

Japan

1970 FISHERY BUDGET WILL BE LARGER

The Japanese Fisheries Agency prepared a budget asking for about US$138.9 million for fiscal year 1970 (Apr. 1970-Mar. 1971. This was over $44 million more than the $94 million budgeted for FY 1969. The budget request was scheduled to be submitted to the Finance Ministry in early September.

1970 Budget Items

Important items in the 1970 budget and funds requested are: (1) vessel construction and remodelling, $2.4 million; (2) a new program of cultivating deep-sea fishery resources--salmon, tuna, crab and euphausid--$342,000; (3) fishing ground development: $892,000 for operating 2 purse seiners in northwest Pacific and off New Zealand, $212,400 subsidy for saury survey in Pacific east of 180° long., $181,400 for tuna research, and $878,400 for 2 trawl explorations off New Zealand and in northeast Atlantic; and (4) fishery imports countermeasure, $16,100. This would establish an import system to cope with impending liberalization of fishery imports. ('Shin Suisan Shimbun,' July 28.)

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NEW DISTANT-WATER GROUNDS MAY HELP DEPRESSED SAURY FISHERY

The Japanese coastal saury fishermen, who could not make money when catches were very good, are now poor because they can't catch enough fish. Saury landings peaked in 1958 with 575,000 metric tons. Later, landings started to decline and, in 1968, slumped to a record low of 130,000 tons.

Cause of Decline Unknown

The fall-off is attributed by some to heavy Soviet fishing off Japan, but Fisheries Agency data show the Soviet catch also has not been good. Despite continued investigations of coastal saury resources, the cause of decline is unknown. Saury fishermen fear there is no hope for recovery.

Tokyo Aids Fishery

In April 1969, to help the depressed fishery, the Fisheries Agency launched a US$50,000 resource survey program to develop new grounds. Six survey cruises were scheduled in offshore waters. However, the industry feels the effort is inadequate. It wants to conduct a separate survey over a much wider Pacific area with major fishery firms. Some large firms have offered to cooperate.

Firms Seek New Grounds

Meanwhile, some leading firms are seeking to develop new grounds in the eastern Pacific. Nihon Suisan has plans to conduct saury fishing in the eastern Pacific and is optimistic about distant-water operations. If downward catch trend continues, the firm believes, the price would remain sufficiently high.

For example, medium saury of 50-60 count per 7.5-kilogram (16.5-pound) box would bring $2.78-3.33 on food-fish market; catches of 130-140 count per 10-kilogram (22-pound) box could be sold for $4.16-5.56 as bait fish.

If Nihon Suisan's expedition develops new grounds for enough home-based vessels, it will help stabilize Japanese saury fleets.

Quantity & Value of Japanese Saury Catch, 1958-68

Year	Catch	Value
	Metric Tons	US$1,000
1968	130,200	18,286
1967	220,087	29,450
1966	241,840	29,008
1965	231,377	26,589
1964	210,689	17,575
1963	384,548	30,919
1962	483,160	18,356
1961	473,792	28,728
1960	287,071	27,908
1959	522,567	27,578
1958	575,087	19,381

Source: 1958-67--Ministry of Agriculture and Forestry Statistics; 1968--Japan Saury Association.

Experimental Fishing Planned

Nihon Suisan applied to Fisheries Agency for a permit to fish experimentally for saury with stick-held dip nets in eastern Pacific from early July 1969. The 538-gross-ton

Japan (Contd.):

trawler 'Shinano Maru' and the 84-ton saury vessel 'Koshu Maru No. 8' would spend 1½ months in area extending southeast from Aleutian Islands to southern coast of California. (One trade journal reported the vessels would fish from July until Dec. with target of 280 tons.)

The Agency reportedly intended to license the operation. The saury fishing industry indicated it would support the venture if it would not affect adversely the coastal saury fishermen and would develop new grounds for them. Nihon Suisan has agreed to make all data available to the industry and to take aboard a representative.

Nichiro Interested

Nichiro Fishing Co. also informed the Agency of its desire to explore saury resources in eastern Pacific. It is considering using three 500-ton trawlers. ('Suisan Shuho,' June 15, and 'Suisancho Nippo,' June 19 & 20.)

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SALMON MOTHERSHIPS
REACH 1969 QUOTA

The 11 Japanese salmon motherships in Area A (north of 45° N. lat.) of the North Pacific attained their 1969 fleet target of 44,000 metric tons in late Aug. By end of Aug., all fleets had returned to Japan.

By species, the fleet catches averaged 30% reds, 30% chums, 30% pinks, and 10% silvers and kings.

Compared with 1967

Compared with the previous good pink salmon year of 1967, pink salmon catches were up, but red salmon landings were down sharply. In 1967, the fleet catches averaged 46% reds, 32% chums, 20% pinks, and 2% silvers and kings.

The 1969 high-seas salmon fishery was hampered by stormy weather and wide dispersion of fish because of cold-water masses. ('Suisan Keizai Shimbun,' Aug. 7.)

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CANNED RED SALMON
EXPORT PRICES RISE

On Aug. 1, 1969, the Japan Canned Salmon and Crab Sales Co. adopted new export prices for fancy-grade canned red salmon to the United Kingdom.

The new prices (c.i.f. plus commission) are: US$24.20 a case for 48 ½-pound cans, and $13.30 a case for 48 ¼-pound cans. They are about $5.60 and $1.00 a case above 1968 prices and new highs.

Why Increase Adopted

The increase was adopted for 2 reasons: 1) to make up for unreasonably low export prices set in 1968; 2) to cope with reduced canned red salmon production by motherships. Their catches this year were largely frozen because of strong domestic demand. ('Suisan Keizai Shimbun,' Aug. 5.)

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CANNED WHITE TUNA
STOCKS EXHAUSTED, PRICES RISE

The Tokyo Canned Tuna Sales Co. had sold all its canned white meat tuna by mid-June as a result of heavy buying by major firms. Since the new business year began April 1969, the Sales Co. received from packers canned white-meat tuna consignments of about one million cases. About 600,000 cases were sold during April, May, and early June; the remaining 400,000 cases were sold in mid-June in one week. Canned light-meat tuna stocks dropped to several thousand cases.

Why Sudden Mass Buying?

On June 24, the Sales Co. directors met to assess situation and to develop countermeasures. They stopped sales of future consignments temporarily until a sufficient supply could be accumulated. Then they would renew selling price and method of sales. General opinion is that trading firms, noting unpromising summer albacore fishery, feared possible shortage and bought early to meet sales targets.

Some Higher Prices

On June 3, 1969, the Sales Co. increased prices for two can sizes of canned white meat

Japan (Contd.):

tuna packed in brine: US$0.28 for 66½-oz. 6's; $0.50 for 6.6-lb. 6's; and $0.45 for chunk white meat tuna in 6.6-lb. 6's. The new prices, exwarehouse Shimizu, are:

Tuna in Brine	$/ Case
	Exwarehouse
White meat solid, 66½-oz. 6's	12.34
White meat solid, 6.6-lb. 6's	21.17
White meat chunk, 6.6-lb. 6's	18.94

('Suisancho Nippo,' and 'Suisan Tsushin,' June 27.)

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CANNED FISH EXPORTS TO WEST GERMANY INCREASE

In 1968, Japanese canned-fish exports to West Germany totaled 13,679 metric tons worth about US$10.9 million. This was an increase of 2,126 tons and $1.6 million over 1967, and 2,257 tons and $1.86 million over 1966.

Canned Tuna & Mackerel

Canned tuna exports to West Germany in 1968 were 94% of her total value of canned-tuna imports. This compared with 91% in 1967 and 83% in 1966. Canned-mackerel exports to West Germany in 1967 and 1968 (none exported in 1966) were 65% of the value of her imports of that product. ('Suisan Tsushin,' July 26.)

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TO SURVEY U.S. CANNED TUNA INDUSTRY

The Japan External Trade Organization, a government agency, is scheduled to survey the U.S. canned tuna industry in fiscal year 1969 (April 1969-March 1970). Major tuna packers in Terminal Island, Calif., and in Puerto Rico will be selected to gain better knowledge of the competitive power of U.S. canned tuna.

The survey will include case studies: (1) plant history, (2) importance to company of tuna-packing plant and its products, (3) source of its major raw materials, (4) manufacture of byproducts and development of new products, (5) cost study, and (6) sales network. ('Nihon Suisan Shimbun,' June 18.)

* * *

CONTRACTS TO BUY SHRIMP FROM CUBA

The Taiyo Fishing Co. recently concluded a long-term shrimp-purchase contract with Cuba. Reportedly it already has taken delivery of 600 metric tons worth about US$500,000. The contract provides for purchase of 1,000-2,000 tons of Cuban shrimp and miscellaneous fish through a triangular trade involving a British agent.

Taiyo's Part

In return, Taiyo will export to Cuba fishing vessels and gear, port machinery, canning plants, and shrimp culture equipment; also, it will provide technical assistance.

Cuba is promoting her fisheries. The shrimp contract is said to be aimed primarily at obtaining technical assistance for their development. ('Suisancho Nippo,' July 30.)

* * *

RESOURCE SURVEYS PLANNED IN 6 COUNTRIES

To promote expansion of distant-water fisheries, the Japan Fisheries Association plans to send resource survey teams to 6 countries during fiscal year 1969 (Apr. 1969-Mar. 1970). Total cost is almost US$144,900; the government is expected to contribute half.

The Surveys

The 6 countries are: Indonesia, New Guinea (Papua), New Zealand, Spanish Sahara, Mauritania, and Chile. ('Suisan Tsushin,' July 29.)

日本

Thailand

BEGINS LARGE-SCALE CARP BREEDING

Large-scale induced breeding of Chinese carp is beginning in Thailand. Several government fisheries stations, the University of Agriculture, and 3 private hatcheries have adopted the technique; about 1,500,000 fry have been produced in 1969. As a result, the market price of fry has dropped about 75%.

Thailand (Contd.):

Catfish Fry

The Bung Borapet and Chiengmai Fisheries Stations continue induced breeding of "Pangasius"--a large catfish greatly appreciated as food fish--and produced about 200,000 fry. Chiengmai Station also breeds "Puntius gonionotus," a variety of carp; it produced about 500,000 fry. ('FAO Fish Culture Bulletin,' vol. 1, no. 3, Apr. 1969.)

South Vietnam

OFFSHORE FISHERY TO BE DEVELOPED

An Offshore Fishery Development Project is now underway in South Vietnam. It is administered by the Food and Agriculture Organization of the United Nations (FAO) under the United Nations Development Program (UNDP). Total funding is US$4.2 million--the U.S. contributes $2 million, the Netherlands $220,000, South Vietnam about $833,000, and about $1 million comes from the UNDP Special Fund.

Purposes

The project is to last 3 to 4 years. Its purposes are: (a) to conduct exploratory deep-sea fishing, mainly trawling for demersal--snappers, cuttlefish, shrimp, etc.--and pelagic species--tuna, mackerel, sardines, etc.; (b) to conduct exploratory coastal trawling and purse seining; (c) to study the commercial feasibility of introducing modern craft and fishing methods to exploit newly found resources; (d) to study current marketing problems, and assess prospects for marketing increased landings, and (e) to train Vietnamese fisheries staff and fishermen.

Survey Areas

A survey area has been designated in the South China Sea within the limits of South Vietnam's Continental Shelf. It has been divided into 3 sections, each corresponding to a phase of the project. Phase 1 includes the area east and south of the Mekong Delta between 105° and 110° E. long., and 5° and 10° N. lat. This area has been divided into 105 grids, with 4 stations in each grid. Phase 2 involves the area south and west of the Mekong Delta in the Gulf of Siam. Phase 3 extends north of the phase 1 area along the east coast. At the stations, the vessels trawl, take depth soundings, measure water temperature, salinity, etc.

Project Vessels

The project requires 2 vessels. One will be needed for 3 years, another for 2, and a third for 1 year. The first is the 'Kyoshin Maru,' a 300-ton stern trawler chartered from the Japanese firm Kyokuyo Hogei. She arrived in December 1968 and operates out of Singapore because the Japanese Seamen's Union insisted that a non-Vietnamese port be selected as her operating base. The 'Hau Nghi,' a 120-ton trawler contributed by the Netherlands, arrived at Singapore in May. She, too, is based in Singapore. Upon completion of the project she will be donated to South Vietnam. The third vessel, considerably smaller than the first two, will be used for purse seining during phase 3. Phase 3 is scheduled to begin by January 1971.

Cruises Underway

Kyoshin Maru has completed 6 of 12 planned cruises in the first of the 3 survey areas. Her initial findings are very encouraging: several commercially important fishing grounds have been discovered. Even at this stage, studies seem to indicate both the economic and technical feasibility of developing South Vietnam's fishing industry to the point of doubling the yearly fisheries catch. It is now 400,000 metric tons. The training of South Vietnamese fishermen, fishery administrators, and specialists, however, is running behind schedule because of the general mobilization. (U.S. Embassy, Saigon, Aug. 5.)

South Korea

MARINE CATCH ROSE OVER 11% IN 1968

South Korea's 1968 marine fisheries catch was 852,291 metric tons, 13.6% more than the 750,349 tons caught in 1967. In reporting these data, the Central Association of Fishery Cooperatives noted that Korea's marine catch growth rate has averaged 13.5% a year since 1962. ('Suisan Keizai,' April 24.)

Planned 1968 fisheries production, including fish culture, was 859,000 tons. Fish culture was to contribute 93,000 tons, or 11%. Actual marine catch in 1968 exceeded planned by 86,000 tons--more than 11.2%.

* * *

S. KOREA TO SEND SURVEY TEAM TO NEW GUINEA

S. Korea plans to send a 3-man survey team to Papua, New Guinea, in Oct. 1969 for one month. The survey follows agreement on fishery cooperation between S. Korea and Australia during Korean President Park's visit to Australia in Sept. 1968.

Survey Objectives

The team will gather data on New Guinea's fisheries, production facilities, marketing and distribution systems to plan for cooperation between the 2 countries.

Speculation in Japan, also planning to send a team to Papua, is that S. Korea may be planning to form a joint venture with Australian interests. ('Katsuo-maguro Tsushin,' July 29.)

* * *

DEEP-SEA FLEET IS EXPANDING RAPIDLY

The Republic of Korea's deep-sea fishing fleet has one of the fastest growth rates in the world. Between January 31 and July 1, 1969, the fleet increased by 19 units (16,926 gross tons) to 209 vessels (63,000)--a 36.5% increase.

Shing Hung Co. Joins Fleet

The largest increase, both vessels and tonnage, resulted from the entry of Shin Hung Fisheries Co. into the North Pacific with 17 vessels (13,560 gross tons). Not all were new; 11 had been fishing shrimp off Indonesia unprofitably. Five new fishing vessels, and a new processing vessel, were bought from Japanese shipyards. The new vessels began fishing Alaska pollock in the Bering Sea in early June. Five gillnetters engaged in a short-lived salmon fishery in Bristol Bay.

Other Companies Active

Dae Lim Fishery Co., a second newcomer in the high-seas fishery, based one 820-gross-ton trawler at Las Palmas, the Canary Islands.

The Korea Deep-Seas Fisheries Co. expanded more than any other of the 18 South Korean companies already deep-sea fishing on January 31; it added 5 vessels and 1,762 tons.

Demersal (Bottom) Trawling

Demersal trawling, insignificant in January, had expanded eightfold by July. In January 1969, the government-sponsored Korea Marine Industry Development Corp. (KMIDC) was fishing bottom-living species with 2 trawlers (2,000 gross tons) based at Las Palmas. By July, 23 vessels (17,594 gross tons) were bottom fishing. Operating from Pusan, Shing Hung and KMIDC fished Alaska pollock in the North Pacific, and KMIDC and Dae Lim trawled from Las Palmas.

Tuna Fleet

The number of tuna vessels remained about the same--187 in January and 186 in July--but gross tonnage increased from 44,315 tons to 45,702. The Korean tuna fleet ranges the world. Thirteen overseas tuna fleet bases were operational in July: American Samoa (about 70 vessels); Fiji Islands (18); New Hebrides (7); Freetown, Sierra Leone (21); Cape Verde Islands (11); Tema, Ghana (4); San Martin, West Indies (4); Abidjan, Ivory Coast (3); Las Palmas (10); Durban, South Africa (20); Tematave, Malagasy (9); Penang, Malaysia (6); and Fortaleza, Brazil (3).

* * *

PICTORIAL REPORT ON KOREAN FISHING & SUPPORT VESSELS OFF ALASKA

William R. Dickinson

Since 1966, when the Republic of Korea (S. Korea) sent its first exploratory fishing vessel through the Aleutians and the Gulf of Alaska, operations have increased each year. In 1969, her activities off Alaska have involved 2 large independent stern trawlers, 2 smaller fleet stern trawlers, 7 side trawlers, 5 gillnetters, two 1,000-ton refrigerated support ships, a 350-ton support ship, and a 7,000-ton factory ship. The 4 stern trawlers are of French manufacture. The large factory ship is an ex-Norwegian unit. The rest of the fleet is Japanese built.

Sought Groundfish Before 1969

Prior fishing efforts had been for ground fish, primarily Alaska pollock (Theragra chalcogrammus) and yellowfin sole (Limanda aspera). In 1969, however, 5 gillnetters worked the approaches of Bristol Bay during the height of the salmon run.

The 1969 fishery was conducted with larger and more efficient ships than the 1967 and 1968 expeditions and, for the first time, appeared economically successful.

Fig. 1 - The 'Kook Yang No. 115' hauling a salmon gillnet in outer Bristol Bay between Port Moller and St. Paul Island. The South Korean salmon boats fishing here in 1969 were in excellent concentrations of red salmon.

Mr. Dickinson is Fisheries Management Agent, BCF, Office of Enforcement and Surveillance, Kodiak, Alaska.

Fig. 2 - The 'Kook Yang No. 118' retrieving a gillnet. Five of these gillnetters operated in the 1969 high seas salmon fisheries off Alaska. They are 107 feet long, 133 gross tons, and appear to be the same basic ship as the seven Kook Yang otter trawlers operating in the same area.

Fig. 3 - The refrigerated processor 'Kook Yang No. 51'. Built in 1959 in Japan as a tuna longliner. She is 141 feet long, 338 gross tons, has three refrigerated holds, a sharp freeze capability of 5 tons daily, and a crew of 33. The Kook Yang No. 51 first appeared off Alaska in 1969 in the high seas salmon fishery.

Fig. 4 - 'Kook Yang No. 112.' In 1969 seven trawlers of this type worked in the bottom trawl fishery off Alaska. They are 107 feet long and 133 gross tons. These otter trawlers are the same basic ship as the five Kook Yang gillnetters that operated in the same area of the eastern Bering Sea and approaches to Bristol Bay.

Fig. 5 - The South Korean stern trawler 'Kang Wha 601' is one of two similar ships which have operated off Alaska since 1968. Built in France in 1966, she is 252 feet long, 1,518 gross tons, with accommodations for a crew of 48. Equipped to both catch and process fish, she has a 900 cu. m. hold capacity and an 18 ton a day sharp freeze capability.

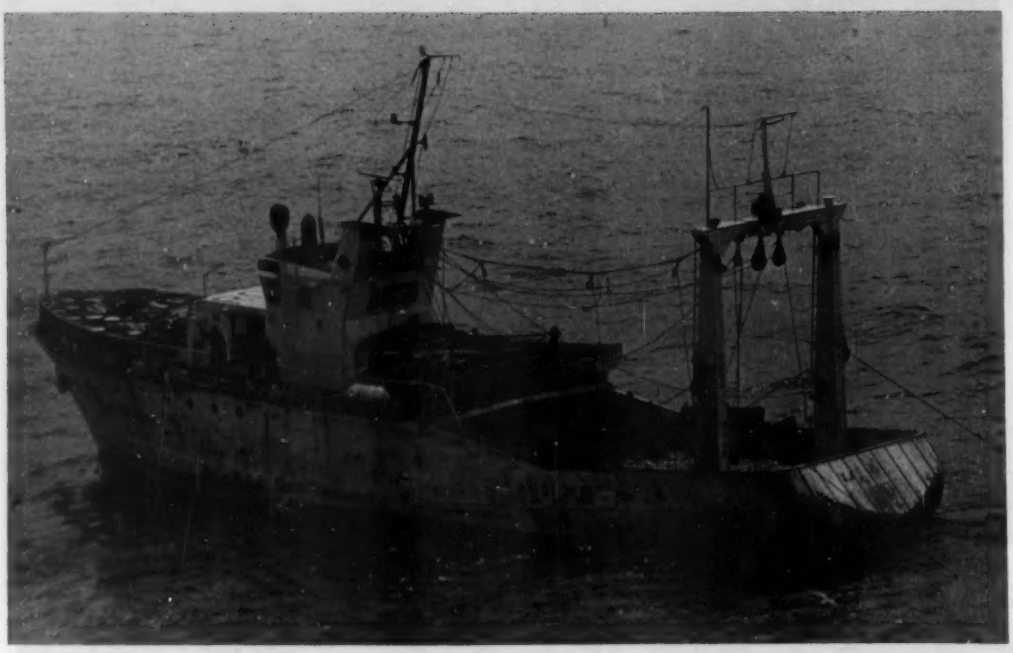

Fig. 6 - The stern trawler 'Keo Mun 501'. This ship is one of two similar French-built small trawlers first seen off Alaska in 1969. The Keo Mun 501, built in 1966, is 106 feet long and 223 gross tons.

Fig. 7 - The South Korean factory ship 'Shin Hung'. Built in Norway in 1947, she was operated by the Norwegians as the refrigerated processor 'Bataan' until 1967, then sold to Shin Hung Refrigeration Co. The Shin Hung is 508 feet long, 7,073 gross tons, with a crew of 200. She first appeared off Alaska in 1969, processing salmon and bottom fish catches from 7 trawlers and 5 gillnetters. She is equipped with: 1) a complete two-line canning plant (10 ton an hour capacity); 2) a reduction plant (25 ton daily capacity); 3) a sharp freezer (100 ton daily capacity); 4) refrigerated holds with a 2,900 ton capacity; and storage space for 400 tons of fish meal, 200 tons of fish oil, and 2,500 tons of canned fish.

SOUTH PACIFIC

Australia

TIGHTENS SHRIMP STANDARDS

Health standards for both imported and exported prawns (or shrimp) have been tightened by new regulations at Federal and State levels.

In New South Wales, the Department of Public Health set bacteria limits for frozen shrimp from any source. In Canberra, the Department of Primary Industry set new standards for frozen green shrimp. The standards have been observed voluntarily for years by importers, who have been paying to have all consignments tested as a health safeguard.

Bacteria Standards

The new regulations define prawn or shrimp as crustacea of families Penaeidae or Palimonidae. When cooked, prawn or shrimp on laboratory examination must comply with following bacteriological standards:

(1) total plate count at 37° C. (96.8° F.) shall not exceed 500,000 per gram; and

(2) count of E. coli (faecal type) shall not exceed 20 per gram; and

(3) count of coagulase positive Staphylococci shall not exceed 100 per gram; and

(4) there must be no salmonella or other pathogenic organisms.

What May Be Added

Permitted additions: Frozen cooked prawn or frozen cooked shrimp may contain ascorbic acid or erythorbic acid (iso-ascorbic acid) or their sodium salts as an antioxidant, in proportion not exceeding 400 parts per million (ppm).

Labelling

(1) Where ascorbic acid or erythorbic acid (iso-ascorbic acid) or their sodium salts is added to frozen fish fillets, or to frozen cooked prawn, or frozen cooked shrimp, those substances shall be deemed antioxidants in written statement on package, or on label attached to package.

(2) No statement shall be written on package, or on label attached to package, that ascorbic acid or erythorbic acid (iso-ascorbic acid) or their sodium salts have been added as vitamins.

Need for Export Standards

Australia's Chief Veterinary Officer said the need to protect this valuable trade has concerned his department and the Australian Fishing Industry Council (A.F.I.C.). He stated that ascorbic acid and sulphite compounds are now permitted for prawn held in storage pending final preparation. He warns against their overuse. The department has reservations about the use of sulphides. It is allowing it for the time being on A.F.I.C's recommendation. The regulation will be reviewed. In the meantime, discoloration or abnormal flavor or odor resulting from sulphide compounds may bring rejection.

Tolerances Permitted

Tolerances allowed include 2% of "soft-shell" in whole, headless, or prawn cutlets--but only a 1 percent tolerance in "deveined" or "cleaned" prawn. Total plate count of prawn tested bacteriologically must not exceed 100,000 organisms per gram. No pathogenic organisms are permitted. ('Fish Trades Review,' June.)

American Samoa

TUNA PRICES REACHED NEW HIGH IN AUGUST

Japanese tuna suppliers and U.S. packers in American Samoa agreed on a $5-a-ton price increase for tuna deliveries in August. The new prices per short ton: round albacore: frozen US$430, iced $415; gilled-and-gutted yellowfin: frozen $347.50. Both albacore and yellowfin prices represent new highs. ('Suisan Tsushin,' Aug. 4.)

AFRICA

Ghana

SEEKS JAPANESE ASSISTANCE

The Ghanaian fishery association recently asked the Japanese Fisheries Agency and the Japan Fishery Association to help it get technical assistance from a private Japanese firm.

The Ghanaian association wants to charter vessels with Japanese crews to develop a tuna fishery. It also wants to set up a small net-manufacturing plant. ('Minato Shimbun,' July 29.)

South Africa

JAPANESE CATCH MANY BLUEFIN TUNA OFF S. AFRICA

The Japanese tuna longliner 'Fukuhisa Maru No. 12' (370 gross tons) reported good fishing for southern bluefin tuna early in July southwest of Cape of Good Hope, South Africa. In 72 sets, the vessel took 150 metric tons of southern bluefin. This was double the average catch per day by vessels in the Tasman Sea off southeast Australia and in the Indian Ocean.

Southern Bluefin Found

According to the Yaizu Fishery Cooperative Association, there is considerable interest in the discovery of southern bluefin off the Cape of Good Hope. If examination shows the meat to be the same as bluefin, it would interest even scientists. ('Minato Shimbun,' July 4.)

Fishery Increased in August

By mid-August, numerous Japanese longliners were fishing southern bluefin off southern Africa, according to the Federation of Japan Tuna Fisheries Cooperative Associations (NIKKATSUREN). Between 60 and 70 vessels were on the Indian Ocean side, and about 10 were on the Atlantic side. Some vessels were able to land about US$417,000 worth in one trip.

Seeking African Port Privileges

NIKKATSUREN, foreseeing increasing fishing activity off Africa, recently sent an official to Lourenco Marques, Mozambique, East London and Port Elizabeth, South Africa, and Walvis Bay, South-West Africa, to secure port entry privileges for Japanese tuna vessels needing supplies. ('Katsuo-maguro Tsushin,' Aug. 15.)

Vessels May Switch From Tasman Sea

The bluefin fishery in the Tasman Sea off southeast Australia continued poor. Daily average was about 2 tons a vessel. In previous years, the longliners had concentrated in that region in August. This year, they were dispersed widely over the entire high-latitude region of the South Pacific. More vessels now are likely to seek the new bluefin grounds in the western Indian and Atlantic oceans. ('Suisan Tsushin,' August 5.)

Albacore Fishery Increases Off Angola & South Africa

Japanese, South Korean, and Taiwanese tuna vessels fishing albacore in the eastern Atlantic were making good catches off Angola and South Africa in July. Combined catch, since season began in early June, was about 15,000 metric tons, ahead of comparable 1968 landings. Although catch per vessel was lower than last year, the number of vessels (especially Taiwanese) had increased considerably. About 15 Japanese, 25 South Korean, and 50 Taiwanese vessels were fishing in early June.

The albacore fishery in the Indian Ocean, near Madagascar, started picking up in late July. Many vessels were averaging 4-5 tons a day.

Export Prices

Export prices for albacore shipments to Puerto Rico held steady in July. They were about US$530 a short ton c.i.f. for large sized (over 30 pounds), and $500 a ton for Grade A and $450 a ton for Grade B smaller sizes.

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PREPARING DUNGENESS CRAB FOR SERVING

Harold Barnett, Arnold Einmo, and Roy Stevens

The general public is unfamiliar with the techniques used in preparing Dungeness crab for the table. This article provides that information. Procedures for cooking, cleaning, and cracking Dungeness crab are described and illustrated. Several popular Dungeness crab recipes are included.

The Dungeness crab, sometimes referred to as the San Francisco or Pacific crab, occurs in abundance on the Pacific coast from California to Alaska. Annual commercial catches of 30 million pounds or more are common.

The crabs grow to be comparatively large: frequently, they attain weight of $3\frac{1}{2}$ to $4\frac{1}{2}$ pounds. Weights of average individual crabs, however, are closer to 2 pounds.

Dungeness crabs are marketed in a variety of forms. These include live crab; whole, cooked crab (fresh and frozen); cooked sections (fresh and frozen); cooked meats (fresh and frozen); and heat-processed canned meats.

The body and leg meat from the Dungeness crab has a distinctive flavor and a delicate texture. Because of its fine flavor and texture, seafood gourmets find Dungeness crab dishes delightful.

Dungeness crabs have always been a popular seafood on the Pacific Coast, but until recently they have been relatively unknown in other parts of the country. Improved methods of transportation, however, have carried them to markets in the Midwest and on the East Coast, where they have been eagerly received by seafood fanciers. The general public, however, is unfamiliar with the techniques used in preparing Dungeness crab for the table.

Presented here are methods of cooking Dungeness crabs, cleaning and cracking them, and preparing Dungeness crab dishes.

I. COOKING DUNGENESS CRABS

To cook sufficient crabs for 6 servings:

1. Obtain 2 or 3 live crabs.

2. Add $\frac{1}{2}$ to $\frac{2}{3}$ cup of table salt to 8 quarts of fresh water, and heat the water to boiling.

3. Place the crabs in the boiling water.

4. After the water returns to a boil (the crabs will momentarily lower the temperature of the water below boiling), cover the pot, and cook the crabs for 15 to 20 minutes.

5. Remove the crabs from the pot, cool them in tap water, and drain them.

II. CLEANING AND CRACKING DUNGENESS CRABS

Clean and crack the cooked crabs in the following manner:

1. Remove the back (Figure 1).

2. Remove the gills (Figure 2).

3. Remove the mouth parts (Figure 3).

4. Remove the viscera from the body cavity by washing it in cold, running water (Figure 4). The yellowish fatty portion, or "crab butter," covering the viscera can be saved for later mixing in to salad dressing (optional).

5. Remove the tail flap (Figure 5) from the underside of the crab.

6. Place your hands on either side of the crab body (Figure 6), and press the body with a rolling motion to loosen body segments (optional).

7. Break the crab into halves, right and left.

8. Separate the legs (Figure 7) in such a manner that the adjacent body segment is attached to each leg.

9. To remove the body meat, grasp each leg as shown in Figure 8, and strike the leg against the side of the bowl.

10. Using a wooden mallet (Figure 9), crack each leg section.

11. Peel off the broken shell (Figure 10), and remove the meat.

12. To recover meats that do not shake out readily, use the tip of a crab leg as a pick (Figure 11).

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Mr. Stevens is Program Coordinator
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Fig. 1 - Removing the back.

Fig. 2 - Removing the gills.

Fig. 3 - Removing the mouth parts.

Fig. 4 - Removing the viscera with cold, running water.

Fig. 5 - Removing the tail flap from the underside of the crab.

Fig. 6 - Loosening the body segments (optional).

Fig. 7 - Separating the legs from the body.

Fig. 9 - Cracking the shell from a leg portion.

Fig. 8 - Shaking body meat from a leg portion.

Fig. 10 - Peeling off broken shell.

Fig. 11 - Using the tip of a crab leg as a pick.

III. PREPARING DUNGENESS CRAB DISHES

The following 3 tested recipes on Dungeness crab salad, imperial crab, and crab Louis[1/] make eating Dungeness crab a pleasure.

A. DUNGENESS CRAB SALAD

The ingredients used in the Dungeness crab salad are:

- 1 pound of Dungeness crab meat
- 1 can (14 or 15 ounces) of artichoke hearts, drained
- 1 can (8 ounces) of cut green beans, drained
- 2 hard-cooked eggs, chopped
- ½ cup of sliced celery
- ¼ cup of sliced raw cauliflower
- ¼ cup of sliced cucumber
- ¼ cup of sliced green pepper
- 1 teaspoon of salt
- ¼ teaspoon of pepper
- ¾ cup of thousand island dressing
- 6 slices of tomato
- 6 leaves of lettuce
- 10 to 15 slices of radish

Prepare the Dungeness crab salad in this way:

1. Remove all shell or cartilage from the meat of the crab; be careful not to break the meat into small pieces.

2. Cut the crab meat into pieces one-half inch long.

3. Cut the artichoke hearts into fourths.

4. Combine all the ingredients except the tomatoes, lettuce, and radishes.

5. Toss the combined ingredients lightly.

6. Arrange a slice of tomato on each leaf of lettuce, and place about 1 cup of salad on each slice of tomato.

7. Garnish the salad with the slices of radish.

The amount of salad suggested serves 6 people.

1/These and other crab recipes prepared by Bureau of Commercial Fisheries home economists are in a publication, Test Kitchen Series No. 10, "How to Cook Crabs." The publication may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

B. IMPERIAL CRAB

The ingredients for imperial crab are:

- 1 pound of crab meat
- 2 tablespoons of chopped onion
- 2 tablespoons of chopped green pepper
- 3 tablespoons of butter or other fat, melted
- 2 tablespoons of flour
- ½ cup of milk
- ½ teaspoon of salt
- Dash of pepper
- ¼ teaspoon of Worcestershire sauce
- 2 hard-cooked eggs, chopped

Prepare the imperial crab in the following manner:

1. Remove all shell or cartilage from the crab meat; be careful not to break the meat into small pieces.

2. Sauté the onion and green pepper in butter until they are tender.

3. Blend the flour into the sautéed onion and pepper.

4. Add milk gradually, and cook the mixture, with constant stirring, until it is thick.

5. Add the seasoning, egg, and crab meat.

6. Place the imperial crab preparation in 6 well-greased individual shells or in 5-ounce custard cups.

7. Bake the crab preparation in a moderate oven (350° F.) for 20 to 25 minutes, or until the preparation is brown.

The amount of imperial crab suggested serves 6 people.

C. CRAB LOUIS

Supplied here are the recipes for crab Louis and for the Louis dressing to be used in the recipes.

1. Recipe for Crab Louis

The ingredients for crab Louis are:

- 1 pound of crab meat
- 1 head of lettuce
- ½ teaspoon of salt
- 1 cucumber, sliced
- 4 tomatoes, sliced
- 3 hard-cooked eggs, sliced

Prepare the crab Louis in this manner:

1. Remove all shell or cartilage from the meat of the crab; be careful not to break the meat into small pieces.

2. Shred the lettuce, and place it in a large, shallow, salad bowl.

3. Sprinkle the components of the salad with salt.

4. Arrange the crab meat over the lettuce.

5. Place alternate slices of cucumbers, tomatoes, and eggs around the edge of the salad bowl.

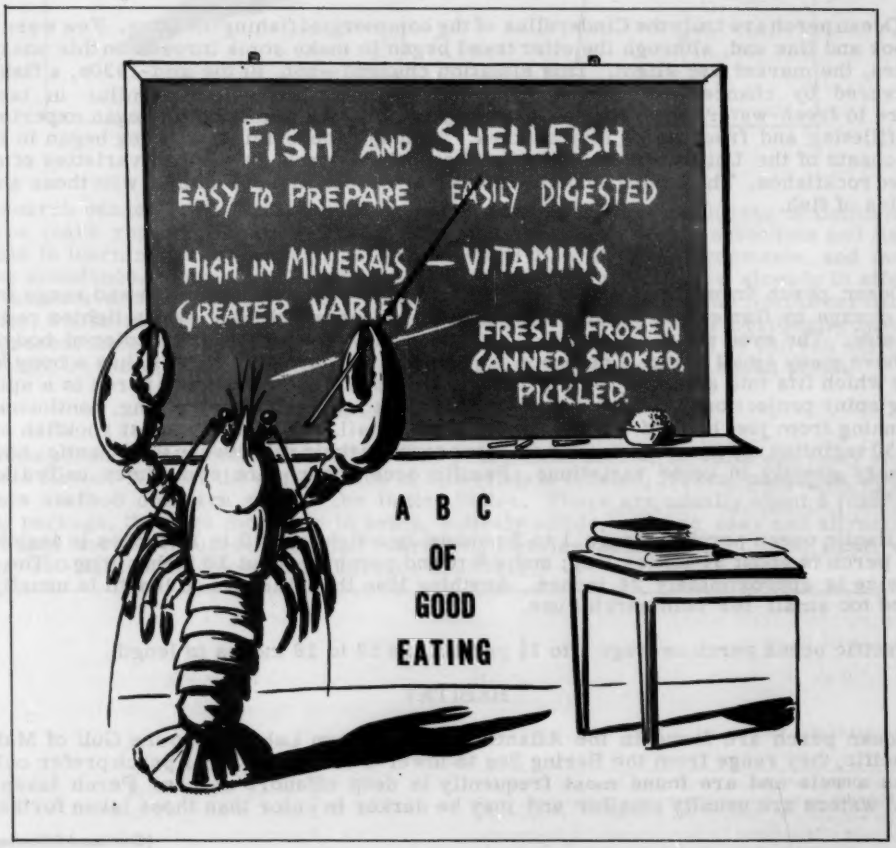
6. Spread Louis dressing over the crab meat.

2. Recipe for Louis Dressing

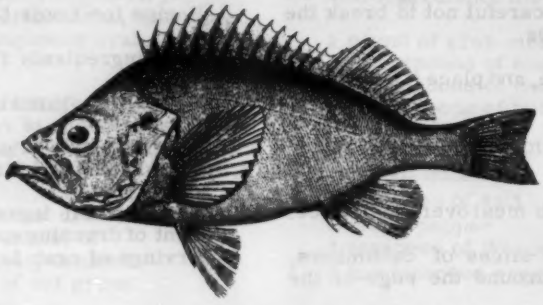
The ingredients for Louis dressing are:

1 cup of mayonnaise or salad dressing
3 tablespoons of catsup
2 tablespoons of chopped sweet pickle
1 tablespoon of lemon juice

Combine all ingredients and chill. The amount of dressing suggested is sufficient for 6 servings of crab Louis salad.



FOOD FISH FACTS



OCEAN PERCH

(Sebastes marinus) -- Atlantic
(Sebastodes alutus) -- Pacific

Ocean perch are truly the Cinderellas of the commercial fishing industry. Few were caught by hook and line and, although the otter trawl began to make some inroads on this unexploited species, the market was slight. This situation changed when, in the mid-1930s, a fish cutter discovered by chance that ocean perch yield small white fillets similar in taste and texture to fresh-water perch fillets. The fishing industry immediately began experimenting with filleting and freezing of this species. Although the original filleting began in Boston, both coasts of the United States harvest either ocean perch or several varieties of closely related rockfishes. The fishing industry entered a "Golden Era of Fishing" with these abundant families of fish.

DESCRIPTION

Ocean perch from the Atlantic are also called redfish or rosefish and range in color from orange to flame red, occasionally grayish or brownish red, with a lighter red on the belly side. The eyes are large and black, contrasting with the brightly colored body. Both jaws have many small teeth. The lower jaw, jutting out beyond the upper, has a bony knob at its tip which fits into a corresponding notch in the upper jaw. The ocean perch is a spiny fish having spiny projections on the sides of the large head as well as on the long, continuous back fin running from just back of the head almost to the tail. The Pacific coast rockfish number about 50 varieties and are very similar in appearance to their relatives in the Atlantic; however, they vary greatly in color variations. Pacific ocean perch are sometimes called longjaw rockfish.

Atlantic ocean perch average 1 to 2 pounds in weight and 12 to 15 inches in length. A $\frac{1}{2}$ pound perch is about $9\frac{1}{2}$ inches long; and a 4 pound perch is about 20 inches long. The maximum size is approximately 24 inches. Anything less than 8 inches in length is usually considered too small for commercial use.

Pacific ocean perch average 1 to $1\frac{3}{4}$ pounds and 12 to 16 inches in length.

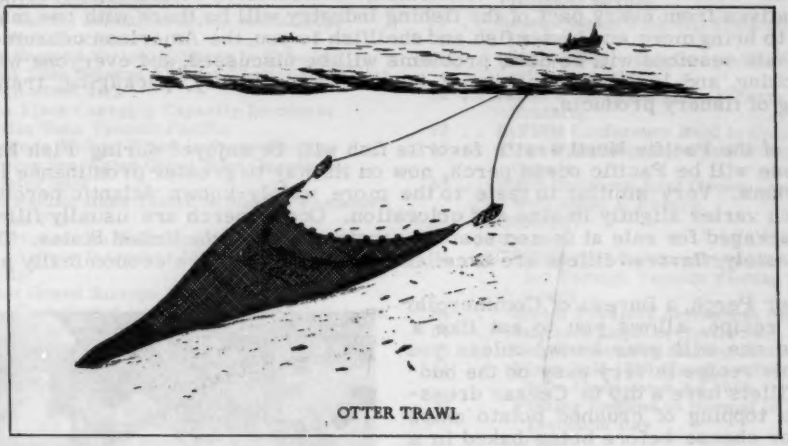
HABITAT

Ocean perch are found in the Atlantic from southern Labrador to the Gulf of Maine; in the Pacific, they range from the Bering Sea to lower California. Ocean perch prefer cold waters as a rule and are found most frequently in deep offshore waters. Perch taken from coastal waters are usually smaller and may be darker in color than those taken further out.

(Continued following page.)

OCEAN PERCH FISHING

Otter trawls are the most commonly used gear in the Atlantic coast fishery for ocean perch, with a trawling depth of approximately 300 to 750 feet. In the Pacific, the high-opening otter trawls are the most effective because the Pacific varieties do not congregate so close to the bottom as other species of these families.



OTTER TRAWL

CONSERVATION

Research vessels of the United States Department of the Interior's Bureau of Commercial Fisheries make regular information gathering cruises which enable scientists and fishery biologists to learn more about ocean perch and other fish, their environments, and factors affecting abundance. Regulations controlling trawl net mesh sizes are already in effect in some fisheries and are a part of the International Commission for the Northwest Atlantic Fisheries, whose 14 members include the United States, Canada, and 12 European countries. At the present time studies are being made and regulations considered by Bureau scientists which might be incorporated through ICNAF to prevent the depletion of ocean perch.

USES OF OCEAN PERCH

Ocean perch is an excellent food fish. The flesh, when cooked, is white and flaky and has a delicate flavor. Almost the entire catch of these fish is filleted, frozen, packaged, and sold at frozen seafood counters across the United States. There are usually about 8 fillets to a 1-pound package, they are moderate in price, entirely edible, and are easy and attractive to prepare and serve. (Source: National Marketing Services Office, BCF, U.S. Dept. of the Interior, 100 East Ohio, Room 526, Chicago, Ill. 60611.)

SEATTLE SEAFOOD SPECTACULAR

The nation's fishermen did not go down to the sea in ships October 5-8 but to Seattle, Washington, for the biggest Annual American Fish Exposition ever to be held. From a regional beginning in Boston three years ago, Fish Expo has grown nationwide, and in 1969, with many foreign countries joining in, will be the largest and finest fisheries exposition in the world. Congressmen, fishermen, wholesalers, retailers, advertisers, and representatives from every part of the fishing industry will be there with one main objective--how to bring more and better fish and shellfish to you, the American consumer. Seminars and talk sessions will be held, problems will be discussed, and everyone will be listening, looking, and learning new ways of improving the quality, packaging, transporting, and selling of fishery products.

Many of the Pacific Northwest's favorite fish will be enjoyed during Fish Expo 1969. Among these will be Pacific ocean perch, now on its way to greater prominence in the nation's markets. Very similar in taste to the more widely-known Atlantic perch, Pacific ocean perch varies slightly in size and coloration. Ocean perch are usually filleted, frozen, and packaged for sale at frozen seafood counters across the United States. The white, flaky, delicately-flavored fillets are excellent eating and they are economically priced.

Chipper Perch, a Bureau of Commercial Fisheries recipe, allows you to eat like a king and no one will ever know, unless you tell, that this recipe is very easy on the budget. The fillets have a dip in Caesar dressing, then a topping of crushed potato chips and Cheddar cheese before being baked in a hot oven. Chipper Perch is meltingly tender after only 10 to 15 minutes baking and ready to serve with its crunchy cheese crown. This recipe offers a whale of an idea for the homemaker--feed the family like royalty while saving money and preparation time.

CHIPPER PERCH

2 lbs. ocean perch fillets or other fish fillets, fresh or frozen

½ cup Caesar salad dressing

1 cup crushed potato chips

½ cup shredded sharp Cheddar cheese

Thaw frozen fillets. Dip fillets in salad dressing. Place fillets in a single layer, skin side down, on a baking pan, 15 x 10 x 1 inches. Combine crushed chips and cheese. Sprinkle over fillets. Bake in an extremely hot oven, 500° F., for 10 to 15 minutes or until fillets flake easily when tested with a fork. Makes 6 servings.

Chipper Perch is one of 25 quick-fix recipes, some economy and some gourmet, in 'Time For Seafood,' a full-color booklet published by the Bureau of Commercial Fisheries. All recipes have been especially planned to give you TIME--time to enjoy, time to relax, time to do your thing. For these flavorful ways to beat the clock, send 45¢ to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 and ask for 'Time For Seafood,' Fishery Market Development Series No. 12 (I 49.49/2:12). (Source: National Marketing Services Office, BCF, U.S. Dept. of the Interior, 100 East Ohio Street, Room 526, Chicago, Ill. 60611.)

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HOW OLD IS THE SCIENCE OF OCEANOGRAPHY?

Mankind has been interested in the oceans since before the time of Aristotle, who wrote a treatise on marine biology in the fourth century B.C. The early studies of the ocean were concerned with problems of commerce; information about tides, currents, and distances between ports was needed.

While he was Postmaster General, Benjamin Franklin prepared temperature tables by means of which navigators could determine whether or not they were in the Gulf Stream. This resulted in faster mail service to Europe.

The beginning of modern oceanography is usually considered to be December 30, 1872, when HMS CHALLENGER made her first oceanographic station on a 3-year round-the-world cruise. This was the first purely deep-sea oceanographic expedition ever attempted. Analysis of sea water samples collected on this expedition proved for the first time that the various constituents of salts in sea water are virtually in the same proportion everywhere (Dittmar's principle).

Even before the CHALLENGER expedition, Lt. Matthew Fontaine Maury of the U.S. Navy was analyzing log books of sailing vessels to determine the most favorable routes. He did much to stimulate international cooperation in oceanography and marine meteorology. The present U.S. Naval Oceanographic Office is an outgrowth of his efforts. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

BACK COVER: A view of storied Gloucester, Mass. Foreground, an old offshore trawler now used as carrier vessel. (Photo: Frank Riley)